

USER'S GUIDE

Embedded MegaRAID[®] Software

July 2006

Version 1.0

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Preface

This document explains how to use the MegaRAID Storage Manager™ software, the MegaRAID BIOS Configuration Utility (CU), and the MegaCLI utility to configure, monitor, and maintain RAID storage configurations with LSI Logic Embedded MegaRAID Software.

Audience

This document assumes that you are familiar with RAID storage configurations and configuration utilities. The people who benefit from this book are network administrators who need to create storage configurations with LSI Embedded MegaRAID Software.

Organization

This document has the following chapters and appendixes:

- [Chapter 1, Overview](#), provides an overview of Embedded MegaRAID Software features and an overview of RAID levels.
- [Chapter 2, Driver Installation](#), explains how to install the Embedded MegaRAID Software drivers for Microsoft Windows and Linux.
- [Chapter 3, MegaRAID BIOS Configuration Utility](#), explains how to use the MegaRAID BIOS CU to create storage configurations.
- [Chapter 4, MegaCLI Command Tool](#), explains how to use the MegaCLI command line utility to create storage configurations.
- [Chapter 5, MegaRAID Storage Manager Software Overview and Installation](#), introduces the main features of the MegaRAID Storage Manager software and explains how to install it.

- [Chapter 6, MegaRAID Storage Manager Window and Menus](#), describes the layout of the Embedded MegaRAID Software window and lists the available menu options.
- [Chapter 7, Configuration](#), describes how to use the Embedded MegaRAID Software to create storage configurations, save configurations, and apply saved configurations to a controller.
- [Chapter 8, Monitoring System Events and Storage Devices](#), explains how the Embedded MegaRAID Software monitors the status of storage configurations and devices and displays information about them.
- [Chapter 9, Maintaining and Managing Storage Configurations](#), describes the MegaRAID Storage Manager software maintenance functions for virtual disks and other storage devices.
- [Appendix A, Events and Messages](#), provides descriptions of the Embedded MegaRAID Software events.

Conventions

The following is a list of notational conventions used throughout this manual:

Notation	Example	Meaning and Use
Courier typeface	<code>.nwk file</code>	Names of commands, files, and directories are shown in Courier typeface.
Bold typeface	fd1sp	In a command line, keywords are shown in bold, non-italic typeface. Enter them exactly as shown.
Italics	<i>module</i>	In command lines and names italics indicate user variables. Italicized text must be replaced with appropriate user-specified items. Enter items of the type called for, using lowercase.
Italic underscore	<i>full_pathname</i>	When an underscore appears in an italicized string, enter a user-supplied item of the type called for with no spaces.
Initial capital letters	Undo Edit Apply	Names of menu commands, options, check buttons, text buttons, options buttons, text boxes, list boxes, and so on, are shown in text with initial capital lettering to avoid misreading. These elements may appear on your screen in all lowercase.
Brackets	[<i>version</i>]	You may, but need not, select one item enclosed within brackets. Do not enter the brackets.
Bar	les les.out2	You may select one (but not more than one) item from a list separated by bars. Do not enter the bar.

Notation	Example	Meaning and Use
Braces	{property -all}	You must select one (but not more than one) item enclosed within braces. Do not enter the braces.
Ellipses	option...	In command formats, elements preceding ellipses may be repeated any number of times. Do not enter the ellipses. In menu items, if an ellipsis appears in an item, clicking that item brings up a dialog box.
Semicolon, and other punctuation		Use as shown in the text.

Note: Notes contain supplementary information that can have an effect on system performance.

Caution: Cautions are notifications that an action has the potential to adversely affect equipment operation, system performance, or data integrity.

Revision History

Document Number	Date Revision	Remarks
DB15-000356-00	July 2006 Version 1.0	Initial release of this document.

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Chapter 1

Overview

This manual explains the features of the Embedded MegaRAID[®] Software. It includes instructions for using the MegaRAID BIOS Configuration Utility, the MegaCLI command line utility, and the MegaRAID Storage Manager[™] software. You can use these three utilities to create storage configurations on physical disk drives controlled by Embedded MegaRAID Software. The manual also includes instructions for installing the Embedded MegaRAID Software drivers in Microsoft Windows and Linux systems.

This chapter contains the following sections:

- [Section 1.1, “Embedded MegaRAID Software Features”](#)
- [Section 1.2, “RAID Overview”](#)

1.1 Embedded MegaRAID Software Features

The Embedded MegaRAID Software supports up to eight SAS or SATA ports, depending on the hardware platform. This provides a cost-effective way to achieve higher transfer rates and reliability.

The following sections list the features of the BIOS, the Ctrl-M Configuration Utility, the driver, and the disk management features.

1.1.1 BIOS Features

The Embedded MegaRAID Software BIOS has the following features:

- Support for Interrupt 13 and Enhanced Disk Drive Specification
- Support for Int19h
- Option ROM size of 64 Kbyte

- Support for BIOS Boot Specification (BBS) (If available in system BIOS, this allows the user to select the controller from which to boot.)
- Support for power-on self test (POST)
- Support for Post Memory Management (PMM): Specification v1.01, November 21, 1997
- Industry-standard EBDA
- POST and run-time BIOS support for device insertion and removal
- Support for Stop On Error during boot-up
- 48-bit LBA support for read, write, and flush cache functions
- Support for drive roaming
- Support for >2 terabyte physical and logical drives
- Support for migration path from Embedded MegaRAID Software to MegaRAID SAS/SATA hardware (this requires support from hardware RAID)

The following features are supported by the BIOS and the Ctrl-M Configuration Utility:

- Automatic resume of rebuilding, Check Consistency, and initialization
- Global hotspare support based on defined size of the array
- Soft Bad Block Management (SBBM) support
- Support for RAID levels 0, 1, and 10
- Support for auto rebuild
- Support for up to eight physical drives and eight logical drives
- Stripe size of 64 Kbytes only
- Support for Disk Coercion, with options *None*, *128 Mbytes*, *1 Gbyte*

1.1.2 Ctrl-M Configuration Utility Features

The Ctrl-M Configuration Utility supports the following features:

- Ability to select a logical drive as boot device (by default, logical drive 0 is the boot drive)
- Support to disable/enable BIOS boot support

- Hot Auto Rebuild (during a hot plug event or when the user forces the physical drive offline)
- Hot Plug support (drive insertion and removal)
- Support for array cache setting (RAID 10 volume is considered as a single array, though it may have 2, 3, or 4 spans)
- Support for >2 terabyte logical drives
- Support for random deletion of logical drives

1.1.3 Driver Features

The Embedded MegaRAID Software driver supports the following features:

- RAID levels 0, 1, and 10
- 48-bit LBA
- Online mirror rebuilding
- Check Consistency for mirrored disks
- Soft Bad Block Management (SBBM)

1.1.4 Manageability/Disk Console Features

The following features are available to manage the logical and physical disks in the system:

- Configuration information display (in MegaRAID BIOS Configuration Utility and MegaRAID Storage Manager software)
- Support for RAID levels 0, 1, and 10
- Online mirror rebuilding
- Online consistency checks
- Array management software
- Error logging and notification
- Support for hot device insertion and removal
- Automatic resume of rebuilding on restart
- Support for manual rebuild
- Ability to create up to eight logical drives per configuration

- Auto-configuration support of newly added physical drive
- Support for global hotspares
- Support for disk coercion
- Array initialization support (fast and normal)
- Logical drive availability immediately after creation
- Supported stripe size of 64 Kbytes

1.2 RAID Overview

This section provides a brief overview of the types of RAID configurations that Embedded MegaRAID Software supports.

The first step in creating a RAID storage configuration is to configure physical disk drives in *arrays*. As defined for Embedded MegaRAID Software, an *array* is a group of one to eight physical disks that is seen by the host computer system as one large disk drive, or *logical drive*. Only one RAID level can be assigned to each array.

- A RAID 0 array consists of one to eight physical drives.
- A RAID 1 array consists of two physical drives.
- A RAID 10 array consists of four, six, or eight drives.

Note: Some hardware configurations do not support eight disk drives. So depending on the hardware, the actual maximum number of drives for RAID 0 and RAID 10 arrays can be fewer than eight.

Important: LSI recommends that you do not use both SAS and SATA drives in the same array. Using different drive interfaces in this way could cause unpredictable behavior, decreased performance, an increased error count, and decreased Mean Time Between Failures (MTBF).

You can use either of these two strategies when creating RAID arrays and logical drives:

- **Maximize Fault Tolerance:** You can maximize fault tolerance to protect against loss of data by creating a RAID 1 array with *mirroring*.

All data is written to the primary disk in the array and is also written (mirrored) to a second disk.

- **Maximize Logical Drive Performance:** You can maximize logical drive performance by creating a RAID 0 array with *striping*. Data is broken into segments and can be simultaneously written to or read from several different *stripes* on several different disks in the array.

RAID 10 arrays combine both striping and mirroring to provide high data transfer rates and data redundancy.

1.2.1 RAID 0 Description

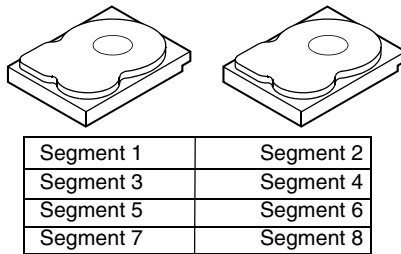
RAID 0 ([Figure 1.1](#)) provides disk striping across all disk drives in the array. RAID 0 does not provide any data redundancy, but does offer the best performance of any RAID level. RAID 0 breaks up data into smaller segments, then stripes the data segments across each drive in the array, as shown in [Figure 1.1](#). The size of each data segment is determined by the stripe size parameter, which is set during the creation of the RAID set.

Note: It is possible to create each disk as a single-drive RAID 0 array. However, spanning across single drive RAID 0 arrays is not supported.

By breaking up a large file into smaller segments, Embedded MegaRAID Software can use both SATA ports and drives to read or write the file faster. This makes RAID 0 ideal for applications that require high bandwidth but do not require fault tolerance.

Uses	Provides high data throughput, especially for large files; any environment that does not require fault tolerance
Strong Points	Provides increased data throughput for large files; no capacity loss penalty for parity
Weak Points	Does not provide fault tolerance; all data lost if any drive fails
Drives	One to eight

Figure 1.1 RAID 0 Array Example with Two Disk Drives

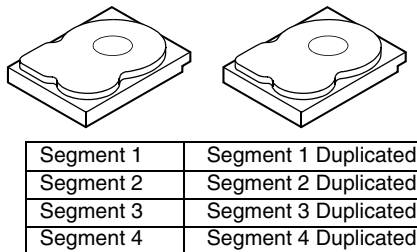


1.2.2 RAID 1 Description

RAID 1 ([Figure 1.2](#)) duplicates all data from one drive to a second drive. RAID 1 provides complete data redundancy, but at the cost of doubling the required data storage capacity.

Uses	Databases or any other mission critical environment that requires fault tolerance
Strong Points	Provides complete data redundancy; RAID 1 is ideal for any application that requires fault tolerance
Weak Points	Requires twice as many hard drives; performance is impaired during drive rebuilds
Drives	Two

Figure 1.2 RAID 1 Array



1.2.3 RAID 10 Description

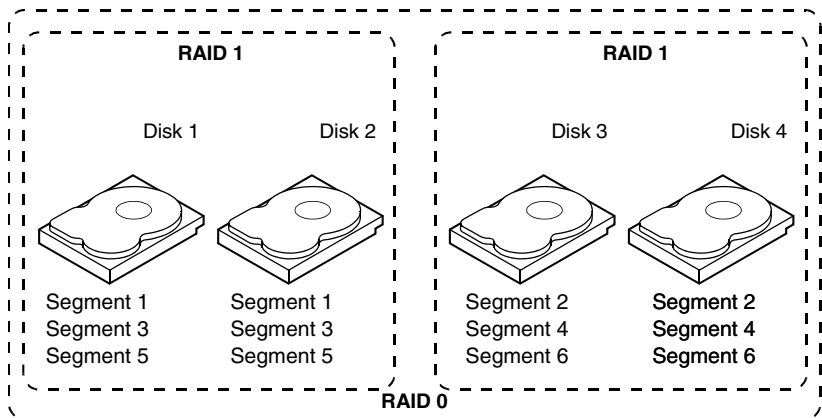
RAID 10, a combination of RAID 1 and RAID 0, has mirrored drives. It breaks up data into smaller blocks, then stripes the blocks of data to each RAID 1 RAID set. Each RAID 1 RAID set then duplicates its data

to its other drive. The size of each block is determined by the stripe size parameter, which is set during the creation of the RAID set. RAID 10 can sustain one drive failure in each array while maintaining data integrity.

Uses	Works best for data storage that must have 100% redundancy of RAID 1 (mirrored arrays) and that also needs the enhanced I/O performance of RAID 0 (striped arrays); RAID 10 works well for medium-sized databases or any environment that requires a higher degree of fault tolerance and moderate to medium capacity
Strong Points	Provides both high data transfer rates and complete data redundancy
Weak Points	Requires twice as many drives
Drives	Four, six, or eight

Figure 1.3 shows a RAID 10 array with four disk drives.

Figure 1.3 RAID 10 Array



Chapter 2

Driver Installation

This chapter explains how to install the Embedded MegaRAID Software drivers for the Windows 2000, Windows 2003, Windows XP, Red Hat Linux, and SuSE Linux operating systems.

Note: No driver installation is required for DOS. The ROM BIOS contains the low-level driver that is required for MS-DOS.

The chapter contains the following sections:

- [Section 2.1, “Windows 2000/2003/XP Driver Installation”](#)
 - [Section 2.2, “Linux Driver Installation”](#)
-

2.1 Windows 2000/2003/XP Driver Installation

Perform the following steps to install the Embedded MegaRAID Software driver for Windows 2000, Windows 2003, or Windows XP.

1. Boot the system with the Windows Boot Installation CD or diskette.

The following message appears:

```
Setup is inspecting your computers hardware  
configuration.
```

2. When the next prompt appears, press **F6** to install the RAID/SCSI adapter driver.
3. When installation prompts for a key after copying some files, press **S** to add the SATA RAID driver.

You are prompted for the floppy diskette that contains the LSI Embedded MegaRAID Software driver.

4. Insert the Embedded MegaRAID Software driver diskette and press **Enter**.

5. Scroll down the list and select the appropriate driver for the Windows version installed on your system, then click **OK**.
6. Continue with the normal installation procedure.

2.1.1 Updating the Windows 2000/2003/XP Driver

Perform the following steps to update the Embedded MegaRAID Software driver for Windows 2000/2003/XP or to install this driver on an existing system booted from a standard IDE drive.

1. Click **Start**, point to **Settings**, and then click **Control Panel**.
2. Double-click **System**, click the **Hardware** tab, and then click **Device Manager**.
Device Manager starts.
3. In Device Manager, double-click **SCSI and RAID Controllers**, right-click the device for which you are installing the driver, and then click **Properties**.
4. On the Driver tab, click **Update Driver** to open the Update Device Driver wizard, and then follow the wizard instructions to update the driver.

2.1.2 Confirming the Windows 2000/2003/XP Driver Installation

Perform the following steps to confirm that the Embedded MegaRAID Software driver for Windows 2000/2003/XP is installed properly.

1. Click **Start**, point to **Settings**, and then click **Control Panel**.
2. Double-click **System**, click the **Hardware** tab, and then click **Device Manager**.
Device Manager starts.
3. In Device Manager, double-click **SCSI and RAID Controllers**, right-click the device for which you are installing the driver, and then click **Properties**.
4. On the Driver tab, click **Driver Details** and verify that the driver information is correct.

2.2 Linux Driver Installation

This section explains how to make fresh installations of the Embedded MegaRAID Software driver for Red Hat Enterprise Linux 3.0 and 4.0 and SuSE Linux Enterprise Server 9.

2.2.1 Obtaining the Driver Image File

The Linux driver is offered in the form of a driver update disk. The required file is `dud-[driver version].img`, which is the driver update disk for the Embedded MegaRAID Software stack.

You can obtain the latest driver files from the Download Center on the LSI web site at: <http://www.lsillogic.com>.

2.2.2 Preparing the Installation Disk(s) for Linux

This section describes how to prepare the Linux installation disk(s) from the driver image files, using either the Windows or Linux operating systems.

2.2.2.1 Preparing Installation Disks with the Windows Operating System

Under Windows, you can use the `rawrite` floppy image writer utility to create disk images from image files. The image writer can be downloaded from the Internet. Perform the following steps to build installation diskettes.

1. Copy the driver update disk image `dud-[driver version].img` and the file `rawrite.exe` to a directory.
2. Confirm that the files are in the selected directory.
3. If necessary, use this command to change the filename of the driver update disk to a name with fewer than eight characters:

```
copy dud-[driver version].img dud.img.
```
4. Open the DOS Command Prompt and navigate to the directory where `rawrite.exe` is located.
5. Type the following command to create the installation diskette:

```
rawrite
```

Then press **Enter**.

You are prompted to enter the name of the boot image file.

6. Type the following:

`dud.img`

Press **Enter**.

You are prompted for the target drive diskette.

7. Insert a floppy diskette into the floppy drive and type:

`A:`

Then press **Enter**.

8. Press **Enter** again to start copying the file to the diskette.
9. After the command prompt returns and the floppy disk drive LED goes out, remove the diskette.
10. Label the diskette with the image name.

2.2.2.2 Preparing Installation Disks with the Linux Operating System

Under Red Hat Linux and SuSE Linux, you can use a driver diskette utility to create disk images from image files. Perform the following steps to create the driver update disk:

1. Copy the driver update disk image `dud-[driver version].img` to a Linux system.
2. Insert a blank floppy diskette into the floppy drive.
3. Confirm that the files are in the selected directory.
4. Create the driver update diskette using the following command:

```
dd if=dud-[driver version].img of=/dev/fd0
```
5. After the command prompt returns and the floppy disk drive LED goes out, remove the diskette.
6. Label the diskette with the image name.

2.2.3 Installing the Red Hat Linux Driver on a New System

This section describes the fresh installation of the Red Hat Enterprise Linux 3.0 or 4.0 device driver on systems with the Embedded MegaRAID Software stack. After you prepare the installation disks with the driver image, perform the following steps to install the driver on a new system.

1. Boot to CD-ROM (Disk 1).

The Red Hat introductory screen appears.

2. Type the following at the boot prompt:

```
linux dd
```

3. Press **Enter**.

The prompt asks whether you have a driver disk.

4. Use the arrow key to select **Yes**, then press **Enter**.

5. Select **fd0** to indicate you have a floppy diskette with the driver on it.

6. Insert the floppy diskette in the **A:/** drive and press **Enter**.

The installer locates and loads the driver for your device. The following message appears:

```
Loading megaswr driver...
```

The prompt at the next screen asks whether you have another driver.

7. Follow the Red Hat Linux installation procedure to complete the installation.
8. Reboot the system.

2.2.4 Updating the Red Hat Linux Driver (Generic)

Perform the following steps to update the Red Hat Linux driver or to install the Red Hat Linux driver in an existing system booted from a standard SAS/SATA drive or systems with the Embedded Software RAID stack.

1. Create a RAID array on the controller using the Embedded SATA RAID Setup Utility.
2. Boot the system with the Red Hat Linux Installation CD from the primary controller or disk.

The Red Hat introductory screen appears.

3. Mount the driver update diskette (DUD) using the following command:

```
#mount /dev/fd0 /mnt/floppy
```

4. Unzip the `modules.cgz` file that is on the DUD to get driver images for different Red Hat operating systems:

```
#mkdir -p /home/megasr
#cd /home/megasr
#cp /mnt/floppy/modules.cgz .
#gunzip -S .cgz modules.cgz
```

This generates a new file named `modules`:

```
#cpio -ivd < modules
```

This provides the following driver images:

```
{<kernel version>,<kernel version>smp,
<kernel version>BOOT }/megasr.o
```

5. Update the Megasr driver module for the required kernels using the following commands:

```
#cd /home/megasr
```

If the `/lib/modules/<kernel version>/update/` directory is present, use the following command:

```
# cp <kernel version>/megaide.[o/ko]
/lib/modules/<kernel version>/update/megaide.[o/ko]
```

If the `/lib/modules/<kernel version>/update/` directory is *not* present, use the following command:

```
# cp <kernel version>/megaide.[o/ko]
/lib/modules/<kernel version>
/kernel/drivers/scsi/megaide.[o/ko]
```

6. Create a Megasr driver entry in the configuration file. The Red Hat configuration file is `/etc/modules.conf`.

If the Megaide entry is not present in `/etc/modules.conf`, add the following line:

```
alias scsi_hostadapter megasr
```

If the `ata_piix` SCSI driver entry (located on the following paragraph) is present in `/etc/modules.conf`, remove it. It must be removed because otherwise the `ata_piix` driver would take control

of the RAID controller without checking the subsystem device or Vendor ID. The `ata_piix` SCSI driver entry is the following:

```
alias scsi_hostadapter ata_piix
```

7. Create a new `initrd` image for the required kernel.

Red Hat installation uses the `mk_initrd` command to create an `initrd` image. The following command creates an `initrd` image for the `<kernel version>smp` kernel in the boot directory. See the `mk_initrd` man page for more information. The command is:

```
#mkinitrd /boot/initrd<kernel version>smp.img.new  
<kernel version>smp
```

8. Modify the `lilo.conf/grub.conf` file by adding newly created `initrd(s)` as new entries in the `/etc/lilo.conf` file.

The suggested method is to copy an existing `lilo` entry in the file and paste it as a new one. Then modify its kernel image name, `initrd` image name, and label name.

Sample Lilo Entry

```
image=/boot/vmlinuz-<kernel version>smp label=linuxnew  
initrd=/boot/initrd-<kernel version>smp.img.new  
read-only appended=root=LABEL=/ "
```

Sample Grub Entry

```
title Red Hat Linux (<kernel version> with Megaide  
    driver)  
root (hd0,0)  
kernel /vmlinuz-<kernel version> ro root=LABEL=  
initrd /initrd-<kernel version>.img.new
```

9. Update the boot loader. If the boot loader is Lilo, run the `lilo` command to update the boot loader. The `lilo` command is:

```
#lilo
```
10. Reboot the system to the new boot loader entry.

2.2.5 Installing the SuSE Linux Enterprise Server 9 Driver

This section describes the fresh installation of the SuSE Linux Enterprise Server 9 driver on a system with the Embedded MegaRAID Software stack. Prepare installation disks with the driver image, then perform the following steps to install the driver.

1. Create a RAID array using the MegaRAID BIOS Configuration utility. (See [Chapter 3, “MegaRAID BIOS Configuration Utility.”](#))
2. Boot the system using the SLES Disk.
3. When the first screen appears, press **F6** and select **Installation** on the menu.

You are prompted for the diskette.

4. Insert the driver update diskette in the A:/ drive and press **Enter**.
5. Press **OK**. The following message appears:

```
LSI Soft RAID Driver Updates added.
```
6. At the menu, select the driver update medium and press the **Back** button.
7. Continue the installation process and complete it.

Chapter 3

MegaRAID BIOS

Configuration Utility

The MegaRAID BIOS Configuration Utility (CU) is used to configure disk arrays and logical drives and to do other configuration tasks in a pre-boot environment. This chapter has the following sections:

- [Section 3.1, “Performing a Quick Configuration”](#)
- [Section 3.2, “Configuring Arrays and Logical Drives”](#)
- [Section 3.3, “Setting the Hard Disk Write Cache and Read Ahead Policies”](#)
- [Section 3.4, “Rebuilding a Drive”](#)
- [Section 3.5, “Hot Plug Support”](#)
- [Section 3.6, “Checking Data Consistency”](#)
- [Section 3.7, “Viewing and Changing Device Properties”](#)
- [Section 3.8, “Forcing Drives Online or Offline”](#)
- [Section 3.9, “Configuring a Bootable Logical Drive”](#)
- [Section 3.10, “Deleting a Logical Drive”](#)
- [Section 3.11, “Clearing a Storage Configuration”](#)

3.1 Performing a Quick Configuration

This section provides high level instructions for quickly configuring arrays and logical drives with the MegaRAID BIOS CU. These instructions are intended for users that are familiar with configuration utilities and tools. Refer to [Section 3.2, “Configuring Arrays and Logical Drives,”](#) for detailed configuration instructions. To ensure the best performance, select the optimal RAID level for the logical drive you create. (For an explanation of RAID levels, see [Chapter 1, “Overview.”](#))

Important: LSI recommends that you do not use both SAS and SATA drives in the same array. Using different drive interfaces in this way could cause unpredictable behavior, decreased performance, an increased error count, and decreased MTBF.

Perform the following steps to configure arrays and logical drives using the MegaRAID BIOS CU:

1. Boot the system.
2. Start the MegaRAID BIOS CU by pressing **Ctrl+M**.
3. Select **Configure** from the Management Menu.
4. Select a configuration method from the Configuration menu (Easy Configuration, New Configuration, or View/Add Configuration).
5. Create arrays using the available physical drives.
6. Define the logical drive(s) using the space in the arrays.
7. Initialize the new logical drive(s).

3.2 Configuring Arrays and Logical Drives

This section provides detailed instructions for configuring arrays and logical drives with the MegaRAID BIOS CU. LSI recommends that you use drives with the same capacity when you create a storage configuration. If you use drives with different capacities in one array, the CU limits each drive to the capacity of the smallest drive.

The number of physical drives in a specific array determines the possible RAID levels that you can implement with the array.

- RAID 0 requires from one to eight physical drives.
- RAID 1 requires two physical drives.
- RAID 10 requires four, six, or eight physical drives.

3.2.1 Starting the MegaRAID BIOS CU

Follow these steps to start the MegaRAID BIOS CU:

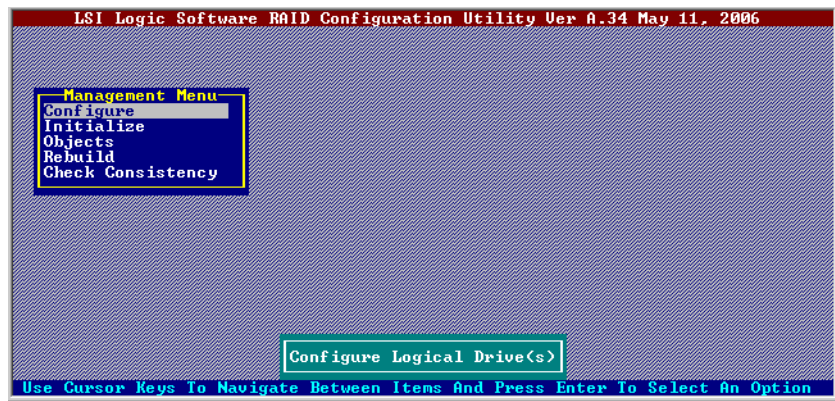
1. During boot-up, wait for the following message to appear on the screen:

Press Ctrl-M to run LSI Logic Software RAID Setup Utility

2. When you see this message, hold down the **Ctrl** key while pressing the **M** key.

The main menu for the Configuration Utility appears, as shown in [Figure 3.1](#).

Figure 3.1 Configuration Utility Main Menu



Note: When you start the MegaRAID BIOS CU by pressing Ctrl-M the Configuration Manager Module of the BIOS allocates three segments of memory using either PMM or conventional memory: these are the Destination Segment, Scratch Segment, and Read Write Buffer Segment. If the three segments are not available the BIOS hooks INT19h

and loads the CU at the fixed segments 5000:0 (Destination Segment), 6000:0 (Scratch Segment) and 7000:0 (Read Write Buffer Segment) after POST.

3.2.2 Using Easy Configuration

When you select the Easy Configuration option, the CU creates one or more arrays from the available physical drives and configures each array as a single logical drive. If logical drives have already been configured, the CU does not change their configuration. Follow these steps to create a logical drive using Easy Configuration:

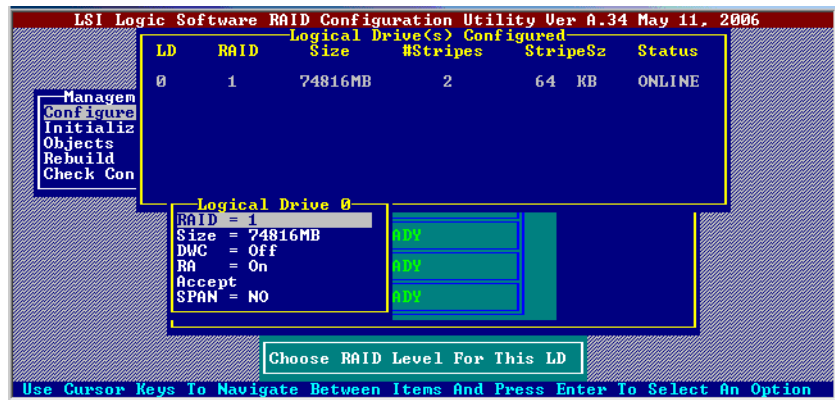
1. Select **Configuration**→ **Easy Configuration** from the Management Menu. A list of available (READY) physical drives appears.
2. Use the arrow keys to select the physical drives to include in the array.
3. Press the spacebar to add each selected physical drive to the new array.

When you select a physical drive, its status changes from `READY` to `ONLIN A[array number] - [drive number]`. For example, `ONLIN A00-01` means array 0, disk drive 1.

4. To create a global hotspare drive, highlight a `READY` disk drive and press **F4**. Then select **Yes** from the pop-up menu.
5. To define multiple arrays, select all the drives you want for the first array, then press **Enter** to start selecting drives for the second array, and so on.
6. When you have selected drives for all desired arrays, press **F10**.
7. Press the spacebar to select an array.

The Logical Drive Configuration screen appears, as shown in [Figure 3.2](#). This screen shows the logical drive number, RAID level, logical drive size, number of stripes in the physical array, stripe size, and state of the logical drive.

Figure 3.2 Logical Drive Configuration Screen



8. Highlight **RAID** and press **Enter**.
The available RAID levels for the current logical drive are displayed.
9. Select a RAID level for the logical drive and press **Enter**.
10. (Optional) Change the drive's default Write Cache and Read Ahead policies (see [Section 3.3, "Setting the Hard Disk Write Cache and Read Ahead Policies"](#)).
11. When you have finished defining the current logical drive, select **Accept** and press **Enter**.
12. Save the configuration when prompted, and press any key to return to the Management Menu.
13. Initialize the new logical drive(s). (See [Section 3.2.5, "Initializing Logical Drives,"](#) for detailed instructions.)

3.2.3 Using New Configuration and View/Add Configuration

When you select the New Configuration menu option, the CU deletes the existing arrays and logical drives and replaces them with the new configuration that you specify. The View/Add Configuration menu option lets you view the existing configuration or add to the existing configuration, if possible.

Caution: If you want to keep the existing data on the storage configuration, use View/Add Configuration instead of New Configuration.

Follow these steps to configure a disk array using the New Configuration or View/Add Configuration option:

1. Select **Configuration**→ **New Configuration** or **Configuration**→ **View/Add Configuration** from the Management Menu. If you selected **New Configuration**, select **Yes** to proceed. (This confirms that you are erasing the existing storage configuration.)

The CU displays an array selection window.

Note: The existing storage configuration will be erased only if you save the newly created configuration at the end of the process. If you do not save the new configuration, the CU will restore the previously existing configuration.

2. Use the arrow keys to select physical drives for the new array.
3. Press the spacebar to add each selected physical drive to the new array.

When you select a drive, its status changes from `READY` to `ONLIN A[array number] - [drive number]`. For example, `ONLIN A00-01` means array 0, disk drive 1.

4. To create a global hotspare drive, highlight a `READY` disk drive and press **F4**. Then select **Yes** from the pop-up menu.

Make sure the capacity of the hotspare drive is equal to or larger than the capacity of the disks in the array and that it is the same type of drive (SAS or SATA).

Note: The hotspare drive will rebuild a failed drive even if it is SAS and the failed drive is SATA, or vice versa. Once the rebuild is completed, however, LSI recommends that you replace the new array member with a drive of the same type.

5. To define multiple arrays, select all the drives you want for the first array, then press **Enter** to start selecting drives for the second array, and so on.
6. When you have selected drives for all desired arrays, press **F10**.
7. Press the spacebar to select an array, if needed.
8. Highlight **RAID** and press **Enter**.

A list of the available RAID levels for the current logical drive appears.

9. Select a RAID level for the logical drive and press **Enter**.
10. (Optional) Set the logical drive size by highlighting **Size** and pressing **Enter**.

The minimum valid logical drive size is 64 Mbytes. An error message will appear if you try to create a logical drive that is smaller than 64 Mbytes. By default, all the available space in the array is assigned to the current logical drive. For RAID 10 arrays, only one logical drive can be defined for the entire array.
11. (Optional) Change the disks's default Write Cache and Read Ahead policies (see [Section 3.3, "Setting the Hard Disk Write Cache and Read Ahead Policies"](#)).
12. When you have finished defining the current logical drive, select **Accept** and press **Enter**.
13. Configure additional logical drives on the same array, if desired. If you have created more than one array, configure a logical drive on the second array.
14. Save the configuration when prompted, and press any key to return to the Management Menu.
15. Initialize the new logical drive(s). (See [Section 3.2.5, "Initializing Logical Drives,"](#) for detailed instructions.)

3.2.4 Creating a Global Hotspare Drive

The MegaRAID BIOS CU enables you to create global hotspare drives (dedicated hotspare drives are not supported). A hotspare drive can automatically replace a failed drive in a redundant RAID 1 or RAID 10 array, to protect against data loss.

Important: When you select disk drive for a global hotspare, be sure it is the same type of drive (either SAS or SATA) as the drives in the arrays that it will protect. LSI recommends that you do not combine SAS and SATA drives in the same array.

You can create a hotspare when you are configuring a new storage configuration, as described in the previous sections. To add a hotspare drive to an existing redundant storage configuration, follow these steps:

1. Select **Objects** from the Management Menu.
2. Select **Physical Drive**. A list of physical drives appears.

3. Select an unconfigured drive or Ready drive from the list, and press **Enter**.
4. When the Physical Drive Property menu appears, select **Make Hot Spare** and press **Enter**.
5. Select **Yes** from the pop-up menu to create the hotspare drive.

Note: To remove a hotspare drive, perform steps 1 and 2 above, select the HOTSP disk, press **Enter**, select **Force Offline**, and press **Enter**. The status of the drive changes to READY, and it can then be used in another new array.

3.2.5 Initializing Logical Drives

Caution: When you initialize a logical drive all existing data on the logical drive is erased.

This section explains the two methods of initializing a logical drive with the MegaRAID BIOS CU. If the *Fast Init* property is enabled, fast initialization will be used. In fast initialization, the MegaRAID BIOS CU quickly writes zeroes to the first and last 8 Mbyte regions of the new logical drive. If the *Fast Init* property is not enabled, the MegaRAID BIOS CU performs a complete initialization on the logical drive. This may take a long time if the physical disk drives are large.

(First Initialization Method) Follow these steps to initialize a logical drive using the Initialize menu.

1. On the Management Menu, select **Initialize**.
2. Use the spacebar to highlight the logical drive to initialize.
The logical drive name is highlighted in yellow. To deselect it, highlight the logical drive and press the spacebar again.
3. Press **F10**.
4. Select **Yes** at the prompt and press **Enter** to begin the initialization.
A graph shows the progress of the initialization until it is complete.

5. After the initialization is complete, press **Esc** to return to previous menus.

If you press **Esc** while initialization is in progress, the following options appear:

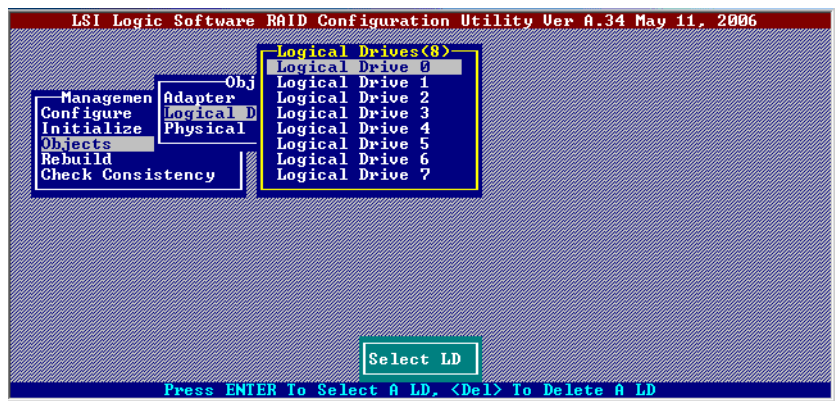
- **Stop:** (Available only if AutoResume is enabled on the adapter: **Management Menu**→ **Objects**→ **Adapter**→ **AutoResume**.) The initialization is stopped, and the CU stores the percentage of the initialization already completed. If *AutoResume* is enabled, and if *Fast Init* is **not** enabled, the initialization resumes where it left off when you restart it, instead of starting over from 0 percent.
- **Continue:** The initialization continues normally.
- **Abort:** The initialization is completely aborted. If you restart initialization, it begins at 0 percent.

(**Second Initialization Method**) Follow these steps to initialize a logical drive using the Objects menu.

1. From the Management Menu, select **Objects**→ **Logical Drive**, as shown in [Figure 3.3](#).

A list of configured logical drives appears.

Figure 3.3 Logical Drive Submenu



2. Select a logical drive, if there is more than one configured, and press **Enter**.
3. Select **Initialize** from the submenu and press **Enter**.

4. Select **Yes** at the prompt and press **Enter**.

The CU displays a bar graph showing the initialization progress.

5. When initialization completes, press **Esc** to return to the previous menu.

If you press **Esc** while initialization is in progress, the *Stop*, *Continue*, and *Abort* options are available, as explained earlier in this section.

3.3 Setting the Hard Disk Write Cache and Read Ahead Policies

You can use the MegaRAID BIOS CU to set the hard disk drive Write Cache and Read Ahead settings. Any read or write cache policy changes apply to all logical drives on an array. In other words, if two logical drives are defined on a single array and you change the Read Ahead setting on one logical drive, the change will also apply to the other logical drive on the array.

The Disk Write Cache and Read Ahead policies can be set to **On** or **Off**.

- When the disk Write Cache is **On**, a write transaction is considered to be complete when all the data has been written to the disk cache. When disk Write Cache is **Off**, the write transaction is complete only when the data has been written to the disk.
- When disk Read Ahead is **On**, extra data is read sequentially ahead of the data that is actually requested and is stored in a cache. If the additional read-ahead data is then requested, it can be read faster from the cache than from the disk directly.

Note: When the disk Write Cache is **On**, there is a danger that data could be lost if the power fails before the cached data is written to disk.

Follow these steps to view or change the logical drive Write Cache or Read Ahead settings:

1. From the Management Menu, select **Objects**→ **Logical Drive**→ **Logical Drive n**→ **View/Update Parameters**.
2. Use the arrow key to move the cursor to **Disk WC** or **Read Ahead** and press **Enter**.

3. Use the arrow key to select **Off** or **On** for Disk WC (DWC) or Read Ahead.
4. When you see the prompt `Change DWC` or `Change Read Ahead`, use the arrow key to select **Off** or **On**, then press **Enter** to change the cache setting.

The settings are changed for all logical drives defined on the array.

3.4 Rebuilding a Drive

The MegaRAID BIOS CU enables you to rebuild a drive of a redundant array if the array has a failed drive. If the failed drive is still good (that is, if the drive is physically present and its size is greater than or equal to the defined size of the array) it will be rebuilt. If the drive is small, an error message will appear and the MegaRAID BIOS CU will not allow the drive to be rebuilt. A rebuild cannot be started on a failed drive if its size is even 1 byte smaller than the defined size of the array.

Follow these steps to rebuild a drive:

1. Select **Rebuild** from the Management Menu.
2. When the list of drives appears, highlight the **FAIL** drive that you want to rebuild and press the **Spacebar** to select it.
3. After selecting the physical drive, press **F10** and select **Yes** at the confirmation prompt.

The rebuild process begins, and a graph shows the progress of the rebuild until it is complete. Although the CU changes the disk drive state to *Rebuild* at this point, the change does not appear on the screen while the rebuild is in progress. If the CU detects a media error on the source drive during rebuild, it initiates a sector read for that block. If the sector read fails, the CU adds entries to the Soft Bad Block Management (SBBM) table, writes this table to the target drive, and displays an error message. Additional error messages are displayed if the SBBM table is 80% full or 100% full. If the SBBM table is completely full, the rebuild operation is aborted, and the drive is marked as *FAIL*.

4. When rebuild is complete, the CU displays the message:

Rebuilding of Drive X Completed Successfully. Press Esc.
(X = the ID of the rebuilt drive.)

5. Press **Esc** to display the Management Menu.

The state of the rebuilt disk drive changes from *FAIL* to *ONLIN*.

If you press **Esc** while the rebuild is running, the following options display:

- **Stop:** (Available only if AutoResume is enabled on the adapter:
Management Menu -> Objects -> Adapter -> AutoResume.)

The rebuild is stopped, and the CU stores the percentage of the rebuild already completed. If AutoResume is enabled, the rebuild resumes where it left off when you restart it, instead of starting over from 0 percent.

- **Continue:** The rebuild continues normally.
- **Abort:** The rebuild is completely aborted and the disk drive remains in the *FAIL* state. If you restart the rebuild, it begins at 0 percent.

3.5 Hot Plug Support

The MegaRAID BIOS CU supports hot plugging of disk drives. The following *hot plug message* will appear when you insert or remove a disk drive: A Drive Has Been Inserted/Removed. Configuration Updated. Press ESC... After you press **Esc** the inserted or removed drive will be reflected in the list of drives that appears in the configuration utility.

Obviously, you should not insert or remove a drive while you are defining a new logical drive or while an initialization or other process is running. The following bullets describe how the CU handles hot plugging when various actions occur:

- If the Physical Drive window or one of the Configuration windows is open when you insert or remove a drive, the window will close when the hot plug message appears.

- CU menus such as Select Boot Drive, Select Adapter, and Logical Drive menus will completely or partially close when a drive is inserted or removed.
- If a Rebuild is in progress when you insert or remove a drive, the CU will first display the message `Rebuilding Of Drive Not Complete! Press Esc..` followed by the hot plug message. If the Rebuild was not affected by this hot plug event, it will continue to rebuild from where it left off, provided that Auto Resume is enabled; otherwise, Rebuild will start over from the beginning. If the rebuilding array was affected by the hot plug event, the Rebuild will abort and the array status will change based on the hot plug operation.
- If an Initialization is in progress when you insert or remove a drive, the CU will display the message `Initialization of Array Not Complete! Press ESC..` followed by the hot plug message.
- If a consistency check is in progress when you insert or remove a drive, the CU will display the message `CC Not Completed! Press ESC..` followed by the hot plug message.

3.6 Checking Data Consistency

The Check Consistency feature can be used on RAID 1 or RAID 10 logical drives to verify the data consistency between the mirrored physical drives. The MegaRAID BIOS CU automatically corrects any differences found in the data when a consistency check is run.

Follow these steps to check consistency:

1. On the Management Menu select **Check Consistency** and press **Enter**.
A list of configured logical drives is displayed.
2. Highlight a logical drive with the arrow keys.
3. Press the spacebar to select the logical drive to check for consistency.

Note: If you select a RAID 0 logical drive, a message appears stating that a Check Consistency cannot be performed. To continue, deselect the logical drive, highlight a redundant logical drive, and press the spacebar again.

4. Press **F10**.
5. At the prompt, select **Yes** to start the Check Consistency process and press **Enter**. A graph shows the progress of the Check Consistency operation until it is complete.

If the MegaRAID BIOS CU finds any data inconsistencies while comparing the source and target drives, it fixes the inconsistency by writing the source data to the target drive. When this happens, the following message appears at the bottom of the screen:

The Data on the Drives is inconsistent. Repair done!

If the MegaRAID BIOS CU finds a media error on the source drive, it pops up a dialog box with this message:

Error in Reading Sectors! Proceed Anyway (Y/N)?

If you press **Y**, the program skips the bad block and continues. If you press **N**, the program aborts the consistency check. The same message appears if the program finds a hard media error on the target drive.

If you press **Esc** while a Check Consistency is running, the following options are displayed:

- **Stop:** (Available only if AutoResume is enabled on the adapter: **Management Menu**→ **Objects**→ **Adapter**→ **AutoResume**.) The Check Consistency is stopped, and the CU stores the percentage of the task already completed. If *AutoResume* is enabled, the Check Consistency resumes where it left off when you restart it, instead of starting over from 0 percent.
- **Continue:** The Check Consistency continues normally.
- **Abort:** The Check Consistency is completely aborted. If you restart it, it begins at 0 percent.

3.7 Viewing and Changing Device Properties

The MegaRAID BIOS CU allows you to view properties for adapters, logical drives, and physical drives. You can also change some properties for adapters and logical drives.

3.7.1 Viewing and Changing Adapter Properties

To view or change adapter properties, follow these steps:

1. On the Management Menu, select **Objects**→ **Adapter**.
2. Select an adapter from the list. The following list of adapter properties appears:

Property	Options	Default
Rebuild Rate	0 to 100 (% of system resources)	30
Chk Const Rate	0 to 100 (% of system resources)	30
FGI Rate (Foreground initialization rate)	0 to 100 (% of system resources)	30
BGI Rate (Background initialization rate)	0 to 100 (% of system resources)	30
Disk WC (Disk Write Cache)	Off, On	Off (Write Through enabled)
Read Ahead	On, Off	On
BIOS State	Enable, Disable	Enable
Stop On Error	No, Yes	No
Fast Init	Enable, Disable	Enable
Auto Rebuild	On, Off	On
Auto Resume	Enable, Disable When Enabled, you can stop a consistency check, rebuild, or initialization and resume it later where it left off, instead of aborting it and starting over.	Enable
Disk Coercion ¹	None, 128MB, 1GB	1GB

1. The Disk Coercion property can be accessed only when no configuration is present for the adapter. Otherwise, an error message will appear.
3. If you want to change the value of a property, highlight it and press **Enter**.
4. Select or type a different value for the property and press **Enter**.
5. When you are finished, press **Esc** until you return to the Management Menu.

3.7.2 Viewing and Changing Logical Drive Properties

To view or change logical drive properties, follow these steps:

1. On the Management Menu, select **Objects** → **Logical Drive**.
2. Select **View/Update Parameters**.

The only logical drive properties you can change are *Disk WC* (Disk Write Cache) and *Read Ahead* (see [Section 3.3, “Setting the Hard Disk Write Cache and Read Ahead Policies”](#)). The other properties are view-only.

3.7.3 Viewing Physical Drive Properties

To view physical drive properties, follow these steps:

1. On the Management Menu, select **Objects** → **Physical Drive**.
2. Highlight a physical drive on the list that appears and press **Enter**.
3. Select **Drive Properties** from the menu.

The drive properties are Device Type (Disk), Capacity, Product ID, and Revision No. These properties are view-only.

3.8 Forcing Drives Online or Offline

The MegaRAID BIOS CU enables you to force drives online or offline. You may want to force a drive of a redundant array offline so that a hotspare drive will automatically replace it. An auto rebuild will begin immediately if the MegaRAID BIOS CU finds a valid hotspare drive to replace the offline drive.

You may need to force a drive online if it has gone offline due to a power failure. The MegaRAID BIOS CU will not allow a drive to be forced online if its size is smaller than the defined size of the array.

To force a drive online or offline, follow these steps:

1. On the Management Menu, select **Objects** → **Physical Drive**.
2. Highlight a physical drive that is a member of an array and press **Enter**.

3. Select **Force Offline** or **Force Online** from the menu.

If the drive was online, its status changes to FAIL. If it was offline, its status changes to ONLIN.

3.9 Configuring a Bootable Logical Drive

The default boot logical drive is LD 0. If you change the boot drive to another logical drive, the BIOS and the CU will preserve this change. However, if you delete the new boot logical drive, you must be sure to configure another logical drive for booting. The MegaRAID BIOS CU will not automatically select a different boot logical drive.

Follow these steps to configure a bootable logical drive:

1. On the Management Menu, select **Configure -> Select Boot Drive**.
2. Select a logical drive from the list to be the designated boot drive.

3.10 Deleting a Logical Drive

Caution: Before you delete a logical drive, be sure to back up all the data you want to keep.

The MegaRAID BIOS CU allows you to delete any single logical drive defined in the configuration (sometimes referred to as *random deletion*). To delete a specified logical drive, follow these steps:

1. Select **Objects -> Logical Drive**.
2. Highlight the logical drive that you want to delete and press **Delete**.
3. Select **Yes** when the confirmation message appears.

3.11 Clearing a Storage Configuration

Caution: Before you clear a storage configuration, be sure to back up all the data you want to keep.

To clear a storage configuration, follow these steps:

1. On the Management Menu, select **Configure** → **Clear Configuration**.
2. When the message appears, select **Yes** to confirm.
All logical drives are deleted from the configuration.

Chapter 4

MegaCLI Command Tool

The MegaCLI Command Tool (CT) is a command line interface application that you can use to configure and maintain storage configurations created with Embedded MegaRAID Software.

Note: The MegaCLI CT runs in the Microsoft Windows and Linux environments. The MegaDCLI CT, which supports a subset of the full command set, runs under DOS only.

This chapter has the following sections:

- [Section 4.1, “MegaCLI CT Overview”](#)
- [Section 4.2, “Exception Handling”](#)
- [Section 4.3, “Command Line Abbreviations and Conventions”](#)
- [Section 4.4, “Adapter Commands”](#)
- [Section 4.5, “BIOS Commands”](#)
- [Section 4.6, “Event Log Commands”](#)
- [Section 4.7, “Configuration Commands”](#)
- [Section 4.8, “Logical Drive Commands”](#)
- [Section 4.9, “Physical Drive Commands”](#)
- [Section 4.10, “Miscellaneous Commands”](#)

4.1 MegaCLI CT Overview

MegaCLI CT and MegaDCLI CT are command line interface applications you can use to configure and manage storage configurations under Embedded MegaRAID Software. You can use these command tools to perform the following tasks:

- Configure logical drives and create configurations on the adapter
- Display the configuration on the adapter
- Display and change logical drive's properties on the adapter
- Display and change physical drive's properties on the adapter
- Display and change adapter properties
- Load a configuration to the adapter from a file
- Save an adapter configuration to a file
- Start or stop rebuild, consistency check, and initialization
- Suspend and display an ongoing background initialization
- Display relevant user messages on the console or write them to the log file
- Work in silent mode, if selected (no messages are displayed on the console)
- Display adapter inventory data in a single command
- Customize output strings
- Exit with predefined success or failure exit codes
- Set some predefined environment variables, such as number of adapters and number of logical drives after the execution of CT
- Display help on how to use the command line options of CT

4.2 Exception Handling

MegaCLI CT exits with exit code 0 for all successful operations. In case of failure, it exits with exit code 1 to 255, depending on the failure conditions. For example, assume that a rebuild is started on three physical drives. MegaCLI CT successfully starts rebuilding the first drive

but fails to start rebuilding the second drive. If this happens, MegaCLI CT will not attempt to start rebuilding the third drive; instead, it will exit with an error exit code. In this case, the error code will be `EXIT_ERR_START_RBLD`. So even if the command was partially successful, an error code is still generated.

Some operations such as `GetNumberOfAdapters` or `GetNumberOfLogicaldrives` return with the actual number of adapters or logical drives. These return values are special cases and do not reflect any error conditions based on the return code, which in these cases contains meaningful values.

4.3 Command Line Abbreviations and Conventions

Some commands let you specify multiple values. You can enter commands for a single adapter (`-aN`), multiple selected adapters (`-a0,1,2`) or all adapters (`-aALL`). This is denoted as `-aN|-a0,1,2|-aALL` in the command line syntax used in this chapter. [Table 4.1](#) lists all of the conventions used in the command line options.

Table 4.1 Conventions

Convention	Description
	Specifies “or,” meaning you can choose between options.
-aN	N specifies the adapter number for the command.
-a0,1,2	Specifies the command is for adapters 0, 1, and 2. You can select two or more adapters in this manner.
-aALL	Specifies the command is for all adapters.
-Lx	x specifies the logical drive number for the command.
-L0,1,2	Specifies the command is for logical drives 0, 1, and 2. You can select two or more logical drives in this manner.
-Lall	Specifies the command is for all logical drives.
{ }	Indicates that the parameter is optional.

You can specify the `-Silent` command line option for all possible functions of the MegaCLI CT. If you enter this option at the command line, no messages are displayed on the screen.

Some MegaCLI CT commands that are supported in hardware RAID configurations are *not* supported under Embedded MegaRAID Software. These include the following:

- Adapter Cache Flush (-AdpCacheFlush)
- Set Adapter Properties: Only the RebuildRate, BgiRate, CCRate, and CoercionMode properties are supported
- Get Adapter Properties: Only the RebuildRate, BgiRate, CCRate, and CoercionMode properties are supported
- Cluster Enable is not supported
- Set Adapter Time (-AdpSetTime)
- Patrol Read (-AdpPR, -AdpPRSetDelay)
- Battery Backup commands (-AdpBbuCmd)
- Set BBU Terminal Logging (-FWTermLog)
- Foreign configuration (-CfgForeign)
- Logical Drive Reconstruction (-LDRecon)
- Set Logical Drive Properties (-LDSetProp)
- Display Enclosure Information (-EncInfo)
- Mark Configured Physical Disk Drive as Missing (-PDMarkMissing)
- Display List of Missing Physical Disk Drives (-PDGetMissing)
- Flashing the firmware (-AdpFWFlash, -AdpM0Flash)
- Diagnostics (-AdpDiag, -AdpBatTest, -AdpNVRAM)

The following sections describe the MegaCLI CT commands.

Note: Software RAID does not support Write Policy, Read Policy, or I/O Policy. Software RAID only support enabling and disabling the hard disk drive's write cache and read-ahead functions.

Note: MegaCLI CT for Embedded MegaRAID Software does not support the concept of disk enclosures, except for a default *Enclosure 0* (E0). Some of the commands support an *E0:Sn* syntax that enables you to specify a disk drive in a particular "slot" in this default enclosure.

4.4 Adapter Commands

You can use the commands in this section to set or display properties related to the adapter(s).

Note: The Embedded MegaRAID Software drivers function as virtual “adapters” or “controllers.” Because the drivers are not actual hardware components, some of the adapter parameters do not apply to them.

4.4.1 Display Adapter Information

Use the command in [Table 4.2](#) to display information on adapter parameters such as the number of logical drives and initiator ID.

Table 4.2 Display Adapter Information

Syntax	<code>CmdTool -AdpAllInfo -aN -a0,1,2 -aALL</code>
Description	Displays parameters on the selected adapter(s). Displayed information includes initiator ID, current status of auto rebuild, alarm, number of logical drives, rebuild rate, bus number/device number, present RAM, SAS settings, serial number of the board, and SAS address. MegaCLI CT does not support display of the firmware version or BIOS version, as the driver does not support it.

4.4.2 Enable or Disable Automatic Rebuild

Use the command in [Table 4.3](#) to turn automatic rebuild on or off for the selected adapter(s). If you have configured hotspares and enabled automatic rebuild, the RAID adapter automatically tries to use them to rebuild failed disks. Automatic rebuild also controls whether a rebuild will start when a drive that was part of the array is reinserted.

Table 4.3 Enable or Disable Automatic Rebuild

Syntax	<code>CmdTool -AdpAutoRbld -Enbl -Dsbl -Dsply -aN -a0,1,2 -aALL</code>
Description	Enables or disables automatic rebuild on the selected adapter(s). The <code>-Dsply</code> option shows the status of the automatic rebuild state.

4.4.3 Set Adapter Properties

This command sets the properties on the selected adapter(s). For example, for {RebuildRate -val}, you can enter a value between 0 percent and 100 percent. (The rebuild rate is the percentage of the compute cycles dedicated to rebuilding failed drives.) At 0 percent, the rebuild is done only if the system is not doing anything else. At 100 percent, the rebuild has a higher priority than any other system activity. The default rebuild rate of 30 percent is recommended.

Use the command in [Table 4.4](#) to display or set adapter properties.

Table 4.4 Set Adapter Properties

Syntax	<code>CmdTool -AdpSetProp {RebuildRate -val} {BgiRate -val} {CCRate -val} {CoercionMode -val} -aN -a0,1,2 -aALL</code>
Description	Sets the properties on the selected adapter(s). The possible settings are: <ul style="list-style-type: none">• RebuildRate: Rebuild rate. Values: 0 to 100.• BgiRate: Background initialization rate. Values: 0 to 100.• CCRate: Consistency check rate. Values: 0 to 100.• CoercionMode: Drive capacity Coercion mode. Values: 0 = None; 1 = 128 Mbytes; 2 = 1 Gbyte. You can set the Coercion mode only when there is no existing configuration on the adapter.

4.4.4 Display Specified Adapter Properties

Use the command in [Table 4.5](#) to display specified properties on the selected adapter(s).

Table 4.5 Display Specified Adapter Properties

Syntax	<code>CmdTool -AdpGetProp RebuildRate BgiRate CCRate CoercionMode -aN -a0,1,2 -aALL</code>
Description	Displays the properties of the selected adapter(s).

4.4.5 Display Adapter Time

Use the command in [Table 4.5](#) to display the current time and date of the selected adapter.

Table 4.6 Display Adapter Time

Syntax	<code>CmdTool -AdpGetTime -aN</code>
Description	Displays the selected adapter's time in yyyyymmdd HH:mm:ss format.

4.4.6 Set Factory Defaults

Use the command in [Table 4.7](#) to set the factory defaults on the selected adapter(s).

Table 4.7 Set Factory Defaults

Syntax	<code>CmdTool -AdpFacDefSet -aN -a0,1,2 -aALL</code>
Description	Sets the factory defaults on the selected adapter(s). You cannot set the factory defaults if the adapter already has a configuration defined on it.

4.5 BIOS Commands

You can use the commands in this section to select the settings for BIOS-related options.

4.5.1 Set or Display Bootable Logical Drive ID

Use the command in [Table 4.8](#) to set or display the ID of the bootable logical drive.

Note: This option does not write a boot sector to the logical drive. The operating system will not load if the boot sector is incorrect.

Table 4.8 Bootable Logical Drive ID

Syntax	<code>CmdTool -AdpBootDrive {-Set -LDID} -Get -aN -a0,1,2 -aALL</code>
Description	<ul style="list-style-type: none">-Set: Sets the logical drive as bootable so that during the next reboot, the BIOS will look for a boot sector in the specified logical drive.-Get: Displays the bootable logical drive ID.

4.5.2 Set BIOS Options

Use the command in [Table 4.9](#) to set the options for the BIOS status.

Table 4.9 Set BIOS Options

Syntax	<code>CmdTool -AdpBIOS -Enbl -Dsbl -Dsply SOE BE -aN -a0,1,2 -aALL</code>
Description	<p>Sets BIOS options. The following are the settings you can select on a single adapter, multiple adapters, or all adapters:</p> <ul style="list-style-type: none">• <code>-Enbl</code>, <code>-Dsbl</code>, <code>-Dsply</code>: Enables, disables or displays the BIOS status on selected adapter(s).• <code>-SOE</code>: Stops on BIOS errors during POST for selected adapter(s). When set to <code>-SOE</code>, the BIOS stops in case of a problem with the configuration. This gives you the option to enter the configuration utility to resolve the problem. This is available only when you enable the BIOS status.• <code>-BE</code>: Bypasses BIOS errors during POST. This is available only when you enable the BIOS status.

4.6 Event Log Commands

Use the command in [Table 4.10](#) to manage the event entries in the event log for the selected adapter(s).

Table 4.10 Event Log Management

Syntax	<code>CmdTool -AdpEventLog -GetEventlogInfo {-GetEvents GetSinceShutdown GetSinceReboot IncludeDeleted {GetLatest <number>} -f <filename>} Clear -aN -a0,1,2 -aALL</code>
Description	<p>The RAID adapter maintains a volatile circular list of 100 events, which is deleted at reboot. The following command options are available:</p> <ul style="list-style-type: none">• <code>-GetEventlogInfo</code>: Displays overall event information such as total number of events, newest sequence number, oldest sequence number, shutdown sequence number, reboot sequence number, and clear sequence number.• <code>-GetEvents</code>: Gets event log entry details. The information shown consists of the total number of entries available at the firmware side since the last clear and details of each error log entry. <code>Start_entry</code> specifies the initial event log entry when displaying the log.• <code>-GetSinceShutdown</code>: Displays all the events since last adapter shutdown.• <code>-GetSinceReboot</code>: Displays all the events since last adapter reboot.• <code>-IncludeDeleted</code>: Displays all events, including deleted events.• <code>-GetLatest</code>: Displays the latest number of events, if it exists. The event data is written to the file in reverse order.• <code>-Clear</code>: Clears the event log for the selected adapter(s).

4.7 Configuration Commands

You can use the commands in this section to create storage configurations.

4.7.1 Add RAID 0 or 1 Configuration

Use the command in [Table 4.11](#) to add a RAID level 0 or 1 configuration to the existing configuration on the selected adapter. For RAID level 10, see [Section 4.7.3, “Add RAID 10 Configuration.”](#)

Important: LSI recommends that you do not use both SAS and SATA drives in the same array. Using different drive interfaces in this way could cause unpredictable behavior, decreased performance, an increased error count, and decreased MTBF.

Table 4.11 Add RAID 0 or 1 Configuration

Syntax	<code>CmdTool -CfgLDAdd -R0 -R1[E0:Sn] [-szXXXXXXXX [-szYYYYYYY [...]]] [-strpszM] [-Hsp[E5:S5,...]] [-afterLdX] -aN</code>
Description	<p>Adds a RAID level 0 or 1 configuration to a specified adapter. Even if no configuration is present, you have the option to write the configuration to the adapter.</p> <ul style="list-style-type: none">• <code>-Rx[E0:Sn]</code>: Used to specify RAID level and physical drive enclosure/slot numbers for an array.• <code>-strpszM</code>: Used (optionally) to specify a stripe size. (Only 64 Kbyte stripe size is currently supported.)• <code>-Hsp[Ex:Sx,...]</code>: Used to create a global hotspare, with physical drive enclosure/slot numbers specified. This option cannot be used to create dedicated hotspares.• <code>-szXXXX</code>: Used to specify the size of a logical drive, where XXXX is a decimal number of Mbytes. However, the actual size of the logical drive may be smaller, because the driver requires the number of blocks from physical drives in each logical drive to be aligned to the stripe size. This option can also be used to create a configuration on the free space available in the array.• <code>-AfterLdX</code>: Used to specify which free slot should be used (optional). By default, MegaCLI CT uses the first free slot available in the array. This option has no meaning if the array is not already used for configuration.

4.7.2 Configure Each Disk as RAID 0

Use the command in [Table 4.12](#) to configure each physical disk in Unconfigured-Good state as RAID 0.

Note: The MegaCLI CT does *not* support spanning across these single-drive RAID 0 configurations.

Table 4.12 Configure Each Disk as RAID 0

Syntax	<code>CmdTool -CfgEachDskRAID0 {WT WB } {NORA RA ADRA} {Direct Cached} {-strpszM} -aN -a0,1,2 -aALL</code>
Description	Configures each physical disk in Unconfigured-Good state as RAID 0 on this controller. See the preceding command for descriptions of the command line options.

4.7.3 Add RAID 10 Configuration

Use the command in [Table 4.13](#) to add a RAID 10 configuration to the existing configuration on the selected adapter. For RAID levels 0 or 1, see [Section 4.7.1, “Add RAID 0 or 1 Configuration.”](#)

Table 4.13 Add RAID 10 Configuration

Syntax	<code>CmdTool -CfgSpanAdd -R10 -Array0[E0:Sn] -Array1[E0:Sn] [...] [{WT WB}] [{NORA RA ADRA}] [{Direct Cached}] [{-strpszM}] -aN</code>
Description	Creates a RAID level 10 (spanned) configuration from the specified arrays. Even if no configuration is present, you must use this option to write the configuration to the adapter. Multiple arrays are specified using the <code>-ArrayX[E0:Sn, . . .]</code> option. (Note that <i>X</i> starts from 0, not 1.) All the arrays must have the same number of physical drives. At least two arrays must be provided. The options {WT WB} {NORA RA ADRA} {Direct Cached} must be entered in the sequence that is shown.

4.7.4 Clear Existing Configuration

Use the command in [Table 4.14](#) to clear the existing storage configuration on the selected adapter(s).

Table 4.14 Clear Existing Configuration

Syntax	<code>CmdTool -CfgClr -aN -a0,1,2 -aALL</code>
Description	Clears the existing storage configuration.

4.7.5 Display Existing Configuration

Use the command in [Table 4.15](#) to display the logical drive and physical disk drive information for the configuration on the selected adapter(s). This command also provides information about the remaining unconfigured space.

Table 4.15 Display Existing Configuration

Syntax	<code>CmdTool -CfgDsply -aN -a0,1,2 -aALL</code>
Description	Displays the existing configuration on the selected adapter(s), which includes the logical drive and component physical drive related details.

4.7.6 Save Adapter Configuration

Use the command in [Table 4.16](#) to save the configuration for the selected adapter(s) to the given filename.

Table 4.16 Save Adapter Configuration

Syntax	<code>CmdTool -CfgSave -fFileName -aN</code>
Description	Saves the configuration for the selected adapter(s) to the given filename, in binary format. The command also stores the controller properties structure in the file.

4.7.7 Restore Configuration Data from File

Use the command in [Table 4.17](#) to read the configuration from the file and load it on the selected adapter(s). You can restore the read/write properties and RAID configuration using hotspares.

Table 4.17 Restore Configuration Data from File

Syntax	<code>CmdTool -CfgRestore -fFileName -aN</code>
Description	<p>Reads the configuration from the file and loads it on the adapter. MegaCLI can store or restore all read and write adapter properties, all read and write properties for logical drives, and the RAID configuration including hotspares.</p> <p>Note the following:</p> <p>The <code>-CfgSave</code> option stores the configuration data and adapter properties in the file. Configuration data has only the device ID and sequence number information of the physical drives used in the configuration. The <code>CfgRestore</code> option will fail if the same device IDs of the physical drives are not present.</p>

4.7.8 Delete Logical Drive(s)

Use the command in [Table 4.18](#) to delete one or more logical drives on the selected adapter(s).

Table 4.18 Delete Logical Drives

Syntax	<code>CmdTool -CfgLDDel -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL</code>
Description	Deletes one logical drive, multiple logical drives, or all the selected logical drives on selected adapter(s).

4.7.9 Display Free Space

Use the command in [Table 4.19](#) to display the free space that is available to use for configuration on the selected adapter(s).

Table 4.19 Display Free Space

Syntax	<code>CmdTool -CfgFreeSpaceInfo -aN -a0,1,2 -aALL</code>
Description	Displays all the free space available for configuration on the selected adapter(s). The information includes the number of disk groups, the number of spans in each disk group, the number of free space slots in each disk group, the start block, and the size (in both blocks and megabytes) of each free space slot.

4.8 Logical Drive Commands

You can use the commands in this section to select settings for the logical drives and to perform actions on them.

4.8.1 Display Logical Drive Information

Use the command in [Table 4.20](#) to display information about logical drives on the selected adapter(s).

Table 4.20 Display Logical Drive Information

Syntax	<code>CmdTool -LDInfo -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL</code>
Description	Displays information about the logical drive(s) on the selected adapter(s). This information includes the name, RAID level, RAID level qualifier, size in megabytes, state, stripe size, number of drives, and span depth. Also displays activity progress, if any, including initialization, background initialization, and consistency check.

4.8.2 Display Logical Drive Disk Cache Settings

Use the command in [Table 4.21](#) to display the disk cache settings for the logical drive(s) on the selected adapter(s).

Table 4.21 Display Logical Drive Cache Settings

Syntax	<code>CmdTool -LDGetProp -DskCache -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL</code>
Description	Displays the disk cache settings of the logical drive(s): -DskCache: Displays physical disk cache policy.

4.8.3 Manage Logical Drive Initialization

Use the command in [Table 4.22](#) to manage initialization of the logical drive(s) on the selected adapter(s).

Note: In all operating system environments *except* DOS, the OS driver starts the initialization process when this command is issued. In DOS, however, there is no OS driver, so the MegaCLI CT just marks the drives for initialization. The initialization actually starts when the driver loads.

Table 4.22 Manage Logical Drive Initialization

Syntax	<code>CmdTool -LDInit -Start [Fast Full] -Abort -ShowProg -ProgDsply -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL</code>
Description	Allows you to select the following actions for logical drive initialization: <ul style="list-style-type: none">• -Start: Starts the initialization (writing 0s) on the logical drive(s) and displays the progress (this is optional). The fast initialization option initializes the first 100 Mbytes on the logical drive. The full option allows you to initialize the entire logical drive.• -Abort: Aborts the ongoing initialization on the LD(s).• -ShowProg: Displays the snapshot of the ongoing initialization, if any.• -ProgDsply: Displays the progress of the ongoing initialization until at least one initialization is completed or a key is pressed.

4.8.4 Manage Consistency Check

Use the command in [Table 4.23](#) to manage a data consistency check (CC) on the logical drives for the selected adapter(s).

Note: In all operating system environments *except* DOS, the OS driver starts the consistency check when this command is issued. In DOS, however, there is no OS driver, so the MegaCLI CT just marks the drives as needing a consistency check. The consistency check actually starts when the driver loads.

Table 4.23 Manage Consistency Check

Syntax	<code>CmdTool -LDCC -Start -Abort -ShowProg -ProgDsply -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL</code>
Description	<p>Allows you to select the following actions for a data consistency check:</p> <ul style="list-style-type: none">• -Start: Starts a CC on the logical drive(s), then displays the progress (optional) and time remaining.• -Abort: Aborts an ongoing CC on the logical drive(s).• -ShowProg: Displays a snapshot of an ongoing CC.• -ProgDsply: Displays ongoing CC progress until at least one CC is completed or a key is pressed.

4.8.5 View Ongoing Background Initialization

Use the command in [Table 4.24](#) to view ongoing background initialization of the selected logical drives, after the `-LDInit` command has been issued to start the initialization. This function completes only when all background initialization processes complete or the user presses a key to exit.

Note: In all operating system environments *except* DOS, the OS driver starts initializing the logical drives when the `-LDInit` command is issued. You can then issue this `-LDBI` command to monitor the initialization progress. In DOS, however, there is no OS driver, so the MegaCLI CT just marks the drives for initialization. The initialization actually starts when the driver loads.

Table 4.24 View Ongoing Background Initialization

Syntax	<code>CmdTool -LDBI -Enbl -Dsbl -GetSetting -ShowProg -ProgDsply -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL</code>
Description	<p>Displays ongoing background initialization of the selected logical drives. This function completes only when all background initialization processes complete or the user presses a key to exit.</p> <ul style="list-style-type: none"> • <code>-Enbl</code>, <code>-Dsbl</code>: Enables or disables the background initialization on the given adapter(s). • <code>-ProgDsply</code>: Allows the user to view ongoing background initialization until all background initialization processes complete or the user presses a key to exit. • <code>-ShowProg</code>: Displays current progress value. • <code>-GetSetting</code>: Displays current background initialization setting (enabled or disabled).

4.8.6 Display Logical Drive and Physical Drive Information

Use the command in [Table 4.25](#) to display information about the logical drives and physical disk drives for the selected adapter(s), such as the number of logical drives, RAID level, and physical disk drive size.

Table 4.25 Display Logical Drive and Physical Disk Drive Information

Syntax	<code>CmdTool -LDPDInfo -aN -a0,1,2 -aALL</code>
Description	Displays information about the logical drive(s) and physical disk drive(s) on the selected adapter(s). Displays information including the number of logical drives, the RAID level of the logical drives, and physical drive size information, which includes raw size, coerced size, uncoerced size, and the SAS address.

4.8.7 Display Number of Logical Drives

Use the command in [Table 4.26](#) to display the number of logical drives attached to the adapter.

Table 4.26 Display Number of Logical Drives

Syntax	<code>CmdTool -LDGetNum -aN -a0,1,2 -aALL</code>
Description	Displays the number of logical drives attached to the adapter. The return value is the number of logical drives.

4.9 Physical Drive Commands

You can use the commands in this section to select settings for the physical disk drives and perform actions on them.

4.9.1 Display Physical Disk Drive Information

Use the command in [Table 4.27](#) to display information about the physical disk drives on the selected adapter(s).

Table 4.27 Display Physical Disk Drive Information

Syntax	<code>CmdTool -PDInfo -aN -a0,1,2 -aALL -PhysDrv[E0:Sn....]</code>
Description	Provides information about the physical disk drives connected to the enclosure and adapter slot. The information includes the drive type, drive size, serial number, and firmware version. For SAS devices, this includes additional information such as the SAS address of the drive.

4.9.2 Set Physical Disk Drive State to Online

Use the command in [Table 4.28](#) to set the state of a physical disk drive to *Online*. In an online state, the physical drive is working normally and is a part of a configured logical drive.

Table 4.28 Set Physical Disk Drive State to Online

Syntax	<code>CmdTool -PDOnline -PhysDrv[E0:Sn....] -aN -a0,1,2 -aALL</code>
Description	Changes the physical disk drive state to <i>Online</i> .

4.9.3 Set Physical Disk Drive State to Offline

Use the command in [Table 4.29](#) to set the state of a physical disk drive to *Offline*. In the offline state, the logical drive is not available to the adapter.

Table 4.29 Set Physical Disk Drive State to Offline

Syntax	<code>CmdTool -PDOffline -PhysDrv[E0:S....] -aN -a0,1,2 -aALL</code>
Description	Changes the physical disk drive state to <i>Offline</i> .

4.9.4 Set Physical Disk Drive State to Unconfigured-Good

Use the command in [Table 4.30](#) to set the state of a physical disk drive from *Unconfigured-Bad* to *Unconfigured-Good*.

Table 4.30 Set Physical Disk Drive State to Unconfigured-Good

Syntax	<code>CmdTool -PDMakeGood -PhysDrv [E0:Sn...] -aN -a0,1,2 -aALL</code>
Description	Changes the physical disk drive state from <i>Unconfigured-Bad</i> to <i>Unconfigured-Good</i> .

4.9.5 Manage Global Hotspares

Use the command in [Table 4.31](#) to manage the configuration and assignment of global hotspares. Make sure the capacity of the hotspare drive is equal to or larger than the capacity of the disks in the array and that it is the same type of drive (SAS or SATA).

Note: The hotspare drive will rebuild a failed drive even if it is SAS and the array drives are SATA, or vice versa. Once the rebuild is completed, LSI recommends that you replace the new array member with a drive of the same type.

Table 4.31 Manage Hotspares

Syntax	<code>CmdTool -PDHSP {-Set} -Rmv -PhysDrv [E0:Sn...] -aN -a0,1,2 -aALL</code>
Description	<ul style="list-style-type: none">• <code>-Set</code>: Changes the physical disk drive state to <i>hotspare</i> for the enclosure.• <code>-Rmv</code>: Changes the physical drive state to <i>ready</i> (removes the hotspare).

4.9.6 Rebuild Physical Disk Drive

Use the command in [Table 4.32](#) to start or stop a rebuild on a physical disk drive and display the rebuild progress. When a physical disk in an array fails, you can rebuild the physical disk by recreating the data that was stored on the physical disk before it failed.

Note: In all operating system environments *except* DOS, the OS driver starts the rebuild when this command is issued. In DOS, however, there is no OS driver, so the MegaCLI CT just marks the drives for rebuild. The rebuild actually starts when the driver loads.

Table 4.32 Rebuild Physical Disk Drive

Syntax	<code>CmdTool -PDRbld -Start -Stop -ShowProg -ProgDsply -PhysDrv [E0:Sn...] -aN -a0,1,2 -aALL</code>
Description	<p>Manages a physical disk rebuild or displays the rebuild progress on one or more adapters. The physical disk must meet the size requirements before it can be rebuilt, and it must be part of an array:</p> <ul style="list-style-type: none"> • <code>-Start</code>: Starts a rebuild on the selected physical drive(s) and displays the rebuild progress (optional). • <code>-Stop</code>: Stops an ongoing rebuild on the selected physical drive(s). • <code>-ShowProg</code>: Displays the current progress percentage and time remaining for the rebuild. This option is useful for running the application through scripts. • <code>-ProgDsply</code>: Displays the ongoing rebuild progress until at least one initialization is completed or a key is pressed.

4.9.7 Locate Physical Disk Drive(s) and Activate LED

Use the command in [Table 4.33](#) to locate physical disk drive(s) by flashing the physical disk activity LED.

Table 4.33 Locate Physical Disk Drive and Flash LED

Syntax	<code>CmdTool -PDLocate -PhysDrv[E0:Sn...] -aN -a0,1,2 -aALL</code>
Description	Locates the physical disk drive(s) for the selected adapter(s) and flashes the disk activity LED.

4.9.8 Replace Configured Disk Drives and Start Automatic Rebuild

Use the command in [Table 4.34](#) to replace a configured physical disk drive and start an automatic rebuild of the drive.

Table 4.34 Replace Configured Disk Drives and Start Automatic Rebuild

Syntax	<code>CmdTool -PDReplaceMissing -PhysDrv[E0:Sn] -ArrayX -RowY -aN</code>
Description	Replaces the configured physical disk drives, then starts an automatic rebuild. The specified arrayIndex and row must be a missing drive.

4.9.9 Prepare Unconfigured Physical Disk Drives for Removal

Use the command in [Table 4.35](#) to prepare an unconfigured physical disk drive(s) for removal from the selected adapter(s).

Table 4.35 Prepare Unconfigured Physical Disk Drives for Removal

Syntax	<code>CmdTool -PDPrpRmv [-Undo] -PhysDrv [E0:Sn...] -aN -a0,1,2 -aALL</code>
Description	Prepares unconfigured physical drive(s) for removal. The drive is spun down, and the drive state is set to <i>unaffiliated</i> , which marks it as offline even though it is not a part of configuration. The <code>-Undo</code> option undoes this operation, and the firmware marks this physical disk as <i>Unconfigured-Good</i> .

4.9.10 Display Number of Physical Disk Drives

Use the command in [Table 4.36](#) to display the total number of physical disk drives attached to an adapter. Drives can be attached directly or through enclosures.

Table 4.36 Display Number of Physical Disk Drives

Syntax	<code>CmdTool -PDGetNum -aN -a0,1,2 -aALL</code>
Description	Displays the total number of physical disk drives attached to an adapter. The return value is the number of physical disk drives.

4.9.11 Display List of Physical Drives

Use the command in [Table 4.37](#) to display a list of the physical drives connected to the selected adapter(s).

Table 4.37 Display List of Physical Drives

Syntax	<code>CmdTool -PDList -aN -a0,1.. -aAll</code>
Description	Displays information about all physical disk drives connected to the selected adapter(s). This includes information such as the drive type, size, serial number, and firmware version. For SAS devices, this includes additional information such as the SAS address.

4.10 Miscellaneous Commands

The commands in this section are used to display various information.

4.10.1 Display MegaCLI Version

Use the command in [Table 4.38](#) to display the version number of the MegaCLI utility.

Table 4.38 Display MegaCLI Version

Syntax	<code>CmdTool -v</code>
Description	Displays the version number of the MegaCLI utility.

4.10.2 Display MegaCLI Help

Use the command in [Table 4.39](#) to display help information for the MegaCLI utility.

Table 4.39 Display MegaCLI Help

Syntax	<code>CmdTool -h -Help ?</code>
Description	Displays help for the MegaCLI utility.

Chapter 5

MegaRAID Storage Manager

Software Overview and Installation

MegaRAID Storage Manager software is a configuration and monitoring utility used with the Embedded MegaRAID Software. This chapter provides a brief overview of the MegaRAID Storage Manager software and explains how to install it on the supported operating systems. This chapter has the following sections:

- [Section 5.1, “Overview”](#)
 - [Section 5.2, “Hardware and Software Requirements”](#)
 - [Section 5.3, “Installation”](#)
-

5.1 Overview

MegaRAID Storage Manager software enables you to configure, monitor, and maintain storage configurations created under Embedded MegaRAID Software. The MegaRAID Storage Manager graphical user interface (GUI) makes it easy for you to create and manage storage configurations.

Note: MegaRAID Storage Manager software can be used to manage a wide range of MegaRAID controllers. Some MegaRAID Storage Manager software features are not applicable for Embedded MegaRAID Software.

5.1.1 Creating Storage Configurations

MegaRAID Storage Manager software enables you to easily configure the controllers, disk drives, and virtual disks on your workstation or server. The Configuration Wizard greatly simplifies the process of creating arrays and virtual disks.

You can use the Configuration Wizard Auto Configuration mode to automatically create the best possible configuration with the available hardware. You can use the Guided Configuration mode, which asks you a few brief questions about the configuration, and then creates it for you. Or you can use the Manual Configuration mode, which gives you complete control over all aspects of the storage configuration.

5.1.2 Monitoring Storage Devices

MegaRAID Storage Manager software displays the status of virtual disks, physical disks, and other storage devices on the workstation or server that you are monitoring. System errors and events are recorded in an event log file and are displayed on the screen. Special device icons appear on the screen to notify you of disk failures and other events that require immediate attention.

5.1.3 Maintaining Storage Configurations

You can use MegaRAID Storage Manager software to perform system maintenance tasks such as running consistency checks on arrays that support redundancy.

5.2 Hardware and Software Requirements

The hardware requirements for MegaRAID Storage Manager software are as follows:

- PC-compatible computer with an IA-32 (32-bit) Intel Architecture processor or an EM64T (64-bit) processor and at least 128 Mbytes of system memory (256 Mbytes recommended)
- Hard disk drive with at least 50 Mbytes available free space

The supported operating systems for the MegaRAID Storage Manager software are as follows:

- Microsoft Windows 2000, Microsoft Windows Server 2003, and Microsoft Windows XP
- Red Hat Linux 3.0 or 4.0
- SUSE SLES 9, with latest updates and service packs

Refer to your server documentation and to the operating system documentation for more information on hardware and operating system requirements.

5.3 Installation

This section explains how to install (or reinstall) MegaRAID Storage Manager software on your workstation or server for the supported operating systems: Microsoft Windows, Red Hat Linux, and SUSE Linux.

5.3.1 Installing MegaRAID Storage Manager Software on Microsoft Windows

Follow these steps if you need to install MegaRAID Storage Manager software on a system running Microsoft Windows 2000, Microsoft Windows Server 2003, or Microsoft Windows XP:

1. Insert the MegaRAID Storage Manager software installation CD in the CD-ROM drive.

If necessary, find and double-click the `setup.exe` file to start the installation program.

2. When the Welcome screen appears, click **Next**.

If MegaRAID Storage Manager software is already installed on this system, the Program Maintenance screen appears. Read the screen text and select **Modify**, **Repair**, or **Remove**.

3. When the next screen appears, read and accept the user license, and click **Next**.

The Customer Information screen appears, as shown in [Figure 5.1](#).

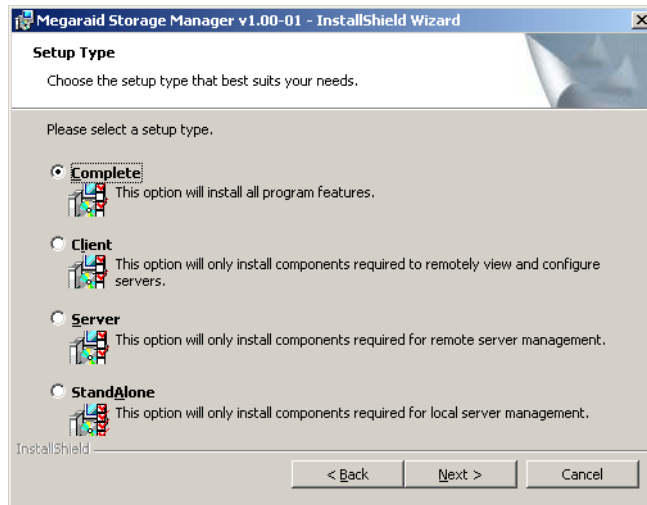
Figure 5.1 Customer Information Screen

The screenshot shows a Windows-style dialog box titled "MegaRAID Storage Manager v1.00-01 - InstallShield Wizard". The main heading is "Customer Information" with the instruction "Please enter your information." Below this, there are two text input fields: "User Name:" containing "Administrator" and "Organization:" containing "MegaComputer". Underneath these fields, there is a section titled "Allow availability of this application for:" with two radio button options: "All users" (which is selected) and "Only for current user (Administrator)". At the bottom of the dialog, there is a status bar with the "InstallShield" logo and three buttons: "< Back", "Next >", and "Cancel".

4. Enter your user name and organization name. In the bottom part of the screen, select an installation option:
 - If you select **All users**, any user with administrative privileges can use this version of MegaRAID Storage Manager software to view or change storage configurations.
 - If you select **Only for current user**, the MegaRAID Storage Manager shortcuts and associated icons will be available only to the user with this user name.
5. Click **Next** to continue.
6. On the next screen, accept the default Destination Folder, or click **Change** to select a different destination folder. Click **Next** to continue.

The Setup Type screen appears, as shown in [Figure 5.2](#).

Figure 5.2 Setup Type Screen



7. Select one of the Setup options. The options are fully explained in the screen text.
 - Normally, you would select **Complete** if you are installing MegaRAID Storage Manager software on a server.
 - Select **Client** if you are installing MegaRAID Storage Manager software on a PC that will be used to view and configure servers over a network.
 - Select **Server** to install only those components required for remote server management.
 - Select **StandAlone** if you will use MegaRAID Storage Manager software to create and manage storage configurations on a standalone workstation.
8. Click **Next** to proceed.
9. Click **Install** to install the program.
10. Click **Finish** when the final Configuration Wizard screen appears.

If you select **Client** installation for a PC used to monitor servers, and if there are no available servers with a registered framework on the local subnet (that is, servers with a complete installation of MegaRAID Storage Manager software), you cannot connect to a remote server unless you

first edit the `startupui.bat` file. Specifically, you must add the IP address of the remote server to the end of the `startupui.bat` file.

For example, to connect to a remote framework on server 192.168.0.10, add the IP address to the end of `startupui.bat` as shown in this example:

```
start JRE\bin\javaw -classpath .;GUI.jar GUI.VivaldiStartupDialog  
ajsgyqkj=71244 192.168.0.10
```

Be sure to include a space in front of the IP address, as shown in the example.

5.3.2 Installing MegaRAID Storage Manager Software for Linux

Follow these steps if you need to install MegaRAID Storage Manager software on a system running Red Hat Linux or SUSE Linux:

1. Copy the `SSM_linux_installer...tar.gz` file to a temporary folder.
2. Untar the `SSM_linux_installer...tar.gz` file using the following command:

```
tar -zxvf SSM_linux_installer...tar.gz
```

A new disk directory is created.

3. Go to the new disk directory.
4. In the disk directory, find and read the `readme.txt` file.
5. To start the installation, enter the following command:

```
./install.sh
```

If you select **Client** installation for a PC used to monitor servers, and if there are no available servers with a registered framework on the local subnet (that is, servers with a complete installation of MegaRAID Storage Manager software), you cannot connect to a remote server unless you first edit the `startupui.sh` file. Specifically, you must add the IP address of the remote server to the end of the `startupui.sh` file.

For example, to connect to a remote framework on server 192.168.0.10, add the IP address to `startupui.sh` as shown in this example:

```
start JRE\bin\javaw -classpath .;GUI.jar GUI.VivaldiStartupDialog  
ajsgyqkj=71244 192.168.0.10
```

Be sure to include a space in front of the IP address, as shown in the example.

5.3.3 Linux Error Messages

One or more of the following messages may appear while you are installing MegaRAID Storage Manager software on a Linux system:

- More than one copy of MegaRAID Storage Manager software has been installed.

This message indicates that the user has installed more than one copy of MegaRAID Storage Manager software. (This can be done by using the `rpm-force` command to install the `rpm` file directly, which is not recommended, instead of using the `install.sh` file.) In such cases, the user must uninstall all the `rpm` files manually before installing MegaRAID Storage Manager software with the procedure listed previously.

- The version is already installed.

This message indicates that the version of MegaRAID Storage Manager software you are trying to install is already installed on the system.

- The installed version is newer.

This message indicates that a version of MegaRAID Storage Manager software is already installed on the system, and it is a newer version than the version you are trying to install.

- Exiting installation.

This is the message that appears when the installation is complete.

- RPM installation failed.

This message indicates that the installation failed for some reason. Additional message text explains the cause of the failure.

Chapter 6

MegaRAID Storage Manager Window and Menus

This chapter explains how to start MegaRAID Storage Manager software and describes the MegaRAID Storage Manager window and menus. This chapter has the following sections:

- [Section 6.1, “Starting MegaRAID Storage Manager Software”](#)
 - [Section 6.2, “MegaRAID Storage Manager Window”](#)
-

6.1 Starting MegaRAID Storage Manager Software

Follow these steps to start MegaRAID Storage Manager software and view the main window:

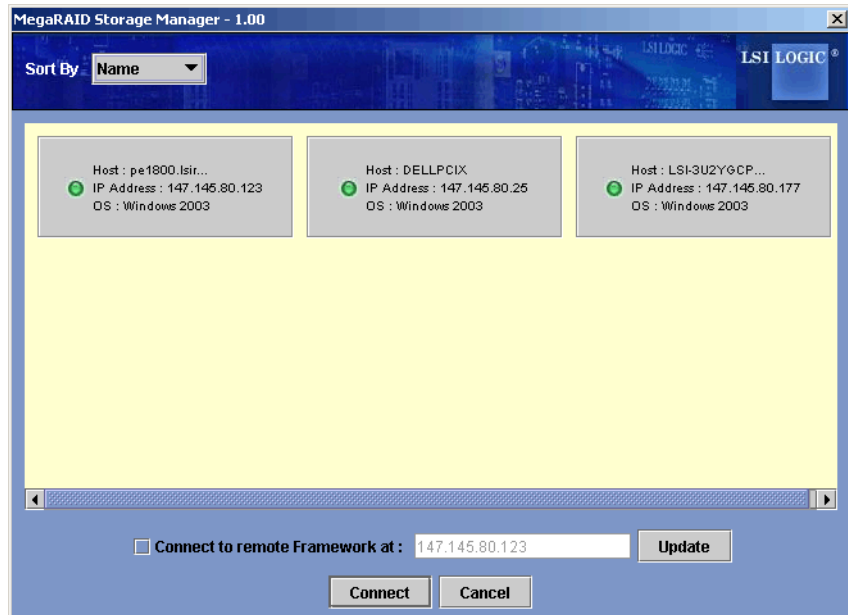
1. Start the program using the method required for your operating system environment:
 - To start MegaRAID Storage Manager software on a Microsoft Windows system, select **Start -> Programs -> MegaRAID Storage Manager -> StartupUI**, or double-click the MegaRAID Storage Manager shortcut on the desktop.

Note: If a warning appears stating that Windows Firewall has blocked some features of the program, click **Unblock** to allow MegaRAID Storage Manager software to start. (The Windows Firewall sometimes blocks the operation of programs that use Java.)

- To start MegaRAID Storage Manager software on a Red Hat Linux system, select **Applications -> System Tools -> MegaRAID Storage Manager StartupUI**.
- To start MegaRAID Storage Manager software on a SUSE SLES 9 system, select **Start -> System -> More Programs -> MegaRAID Storage Manager**.

When the program starts, the Select Server window appears, as shown in [Figure 6.1](#).

Figure 6.1 Select Server Window

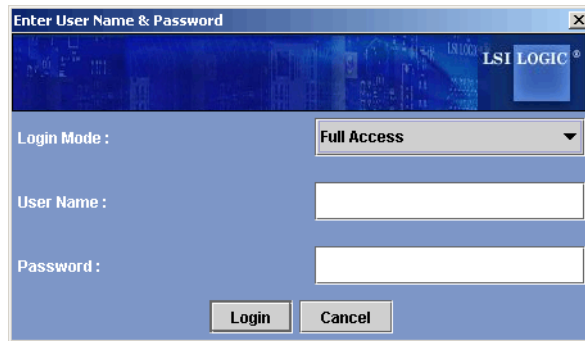


If the circle in the server icon is yellow instead of green, it means that the server is running in a degraded state—for example, because a disk drive used in a virtual disk has failed. If the circle is red, the storage configuration in the server has failed.

Note: To access servers on a different subnet, type in the box at the bottom of the screen the IP address of a server in the desired subnet where MegaRAID Storage Manager software is running, and click **Update**. If you check the **Connect to remote Framework** box, you can also access a standalone installation of MegaRAID Storage Manager software, if it has a network connection.

2. Double-click the icon of the server that you want to access. The Server Login window appears, as shown in [Figure 6.2](#).

Figure 6.2 Server Login Window



3. Select an access mode from the drop-down menu.
 - Select **Full Access** if you need to both view the current configuration and change the configuration.
 - Select **View Only** if you need to only view and monitor the configuration.
4. Enter your user name and password, and click **Login**.

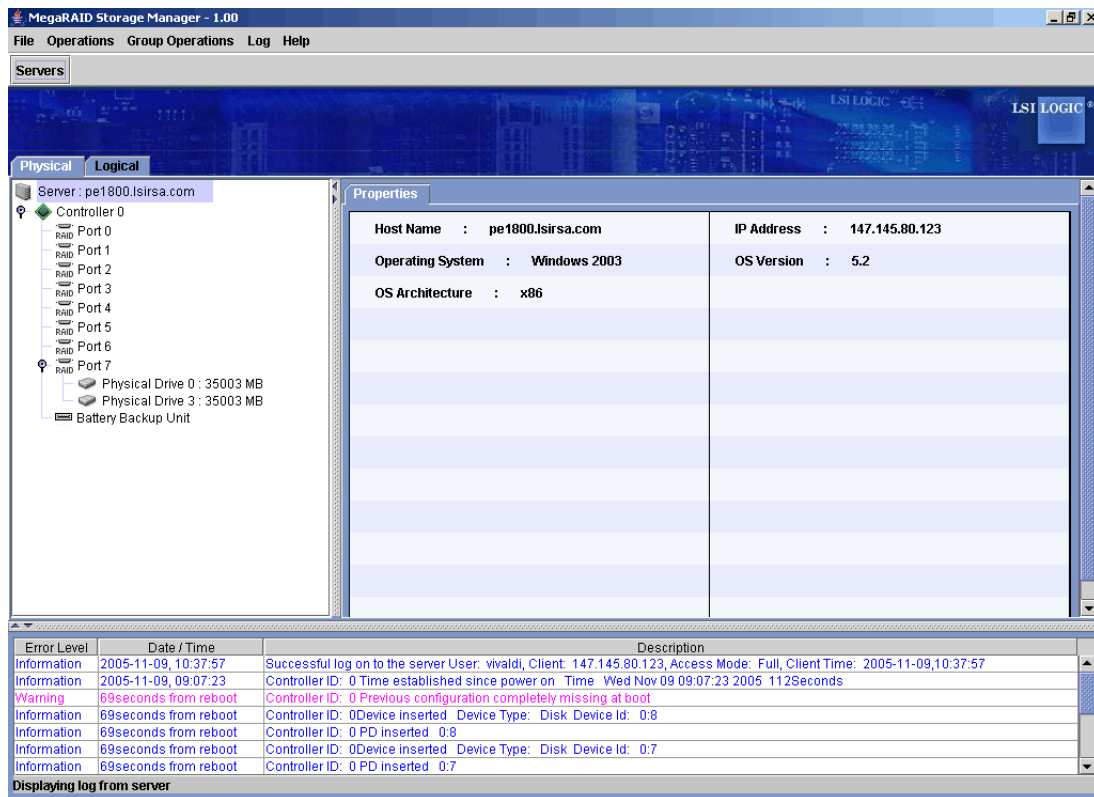
Note: If the computer is networked, this is the login to the computer itself, not the network login.

You must enter the root/administrator user name and password to use Full Access mode. If your user name and password are correct for the Login mode you have chosen, the main MegaRAID Storage Manager window appears.

6.2 MegaRAID Storage Manager Window

This section describes the MegaRAID Storage Manager window, which is shown in [Figure 6.3](#).

Figure 6.3 Main MegaRAID Storage Manager Window









The following topics describe the panels and menu options that appear in this window.


6.2.1 Physical/Logical View Panel


The left panel of the MegaRAID Storage Manager window displays either the *Physical view* or the *Logical view* of the system and the devices in it, depending on which tab is selected.

- The Physical view shows the hierarchy of physical devices in the system. At the top of the hierarchy is the system itself. One or more controllers are installed in the system. Each controller has one or more ports. Disk drives and other devices are attached to the ports.
- The Logical view shows the hierarchy of controllers, virtual disks, and disk groups that are defined on the system. (Physical drives also appear in the Logical view, so you can see which physical drives are used by each virtual disk.)

The following icons in the left panel represent the controllers, disk drives, and other devices:

- System 
- Controller 
- Port 
- Array 
- Virtual disk 
- Physical drive 

A red circle to the right of an icon indicates that the device has failed. For example, this icon indicates that a physical drive has failed: .

A yellow circle to the right of an icon indicates that a device is running in a degraded state. For example, this icon indicates that a virtual disk is running in a degraded state because a disk drive has failed: .

6.2.2 Properties/Operations/Graphical View Panel

The right panel of the MegaRAID Storage Manager window has either two or three tabs, depending on what kind of device is selected in the left panel.

- The *Properties* tab displays information about the selected device. For example, if a controller icon is selected in the left panel, the Properties tab lists information such as the controller name and the device port count. For more information, see [Section 8.2, “Monitoring Controllers,”](#) [Section 8.3, “Monitoring Disk Drives,”](#) and [Section 8.4, “Monitoring Virtual Disks.”](#)
- The *Operations* tab lists the operations that can be performed on the device that is selected in the left panel. Some types of devices, such as arrays and ports, do not have operations associated with them. For more information, see [Chapter 9, “Maintaining and Managing Storage Configurations.”](#)
- The *Graphical View* tab can be selected in the right panel if a physical drive or virtual disk is selected in the left panel. In graphical view, the device’s storage capacity is color coded according to the legend shown on the screen. For example, on a physical drive configured space is blue, available space is white, and reserved space is red. For more information, see [Section 8.3, “Monitoring Disk Drives,”](#) and [Section 8.4, “Monitoring Virtual Disks.”](#)

6.2.3 Event Log Panel

The lower part of the MegaRAID Storage Manager window displays the system event log entries, as shown in [Figure 6.3](#). New event log entries appear during the session. Each entry has a timestamp and date, an error level indicating the severity of the event, and a brief description of the event.

For more information about the event log, see [Section 8.1, “Monitoring System Events.”](#) For more information about the event log entries, see [Appendix A, “Events and Messages.”](#)

6.2.4 Menu Bar

Here are brief descriptions of the main selections on the MegaRAID Storage Manager menu bar. Specific menu options are described in more detail in Chapters 7, 8, and 9 of this manual.

6.2.4.1 File Menu

The File menu has an Exit option for exiting from the MegaRAID Storage Manager software. It also has a Rescan option for updating the display in the MegaRAID Storage Manager window. (Rescan is seldom required; the display normally updates automatically.)

6.2.4.2 Operations Menu

The Operations menu is available when a controller, physical drive, or logical drive is selected in the MegaRAID Storage Manager window. The Operations menu options vary depending on what type of device is selected in the left panel of the MegaRAID Storage Manager window. The options also vary depending on the current state of the selected device. For example, if you select an offline physical drive, the Make Drive Online option appears in the Operations menu.

You can also view the Operations selections on the main window on the Operations tab in the right panel. If an operation requires user inputs before it can be executed, it appears in the Operations tab but not in the Operations menu. A device-specific Operations menu pops up if you right-click a device icon in the left panel.

An Advanced Operations submenu is also available. This is where you access the Configuration Wizard and other configuration-related commands. To access this menu, select **Operations -> Advanced Operations**.

6.2.4.3 Group Operations Menu

The Group Operations menu options include Check Consistency, Initialize, and Show Progress.

6.2.4.4 Log Menu

The Log menu includes options for saving and clearing the message log. For more information, see [Appendix A, “Events and Messages.”](#)

6.2.4.5 Help Menu

On the Help menu you can select **Help -> Help** to view the MegaRAID Storage Manager software online help file. You can select **Help -> About** to view version information for the MegaRAID Storage Manager software.

Note: When you use the MegaRAID Storage Manager software online help, you may see a warning message that Internet Explorer has restricted the file from showing active content. If this warning appears, click on the active content warning bar and enable the active content.

Chapter 7

Configuration

You use MegaRAID Storage Manager software to create and modify storage configurations. RAID 0, RAID 1, and RAID 10 storage configurations are supported.

Important: LSI recommends that you do not use both SAS and SATA drives in the same array. Using different drive interfaces in this way could cause unpredictable behavior, decreased performance, an increased error count, and decreased MTBF.

Note: You cannot create or modify a storage configuration unless you are logged on to a server with administrator privileges.

This chapter explains how to use MegaRAID Storage Manager software to perform the following configuration tasks:

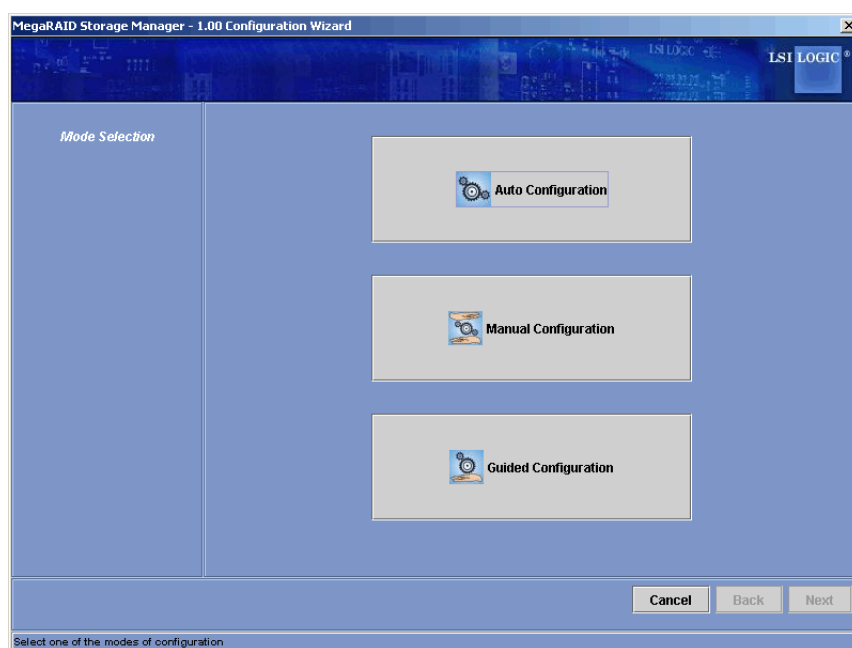
- [Section 7.1, “Creating a New Storage Configuration”](#)
- [Section 7.2, “Adding Hotspare Disks”](#)
- [Section 7.3, “Changing Adjustable Task Rates”](#)
- [Section 7.4, “Changing Virtual Disk Properties”](#)
- [Section 7.5, “Deleting a Virtual Disk”](#)
- [Section 7.6, “Saving a Storage Configuration to Disk”](#)
- [Section 7.7, “Clearing a Storage Configuration from a Controller”](#)
- [Section 7.8, “Adding a Saved Storage Configuration”](#)

7.1 Creating a New Storage Configuration

You can use the MegaRAID Storage Manager Configuration Wizard to create new storage configurations. To open the MegaRAID Storage Manager Configuration Wizard, select a controller in the left panel of the MegaRAID Storage Manager window and then select **Operations -> Advanced Operations -> Configuration -> Configuration Wizard**.

Figure 7.1 shows the first Configuration Wizard screen.

Figure 7.1 First Configuration Wizard Screen



The menu lists three configuration modes:

- **Auto Configuration** automatically creates an optimal configuration from the available disk drives.
- **Manual Configuration** gives you the greatest level of control in creating a new virtual disk.

- **Guided Configuration** asks you a few simple questions about what kind of configuration you want and then automatically creates it from the available disk drives.

Note: You can use Auto, Guided, or Manual mode to create a RAID 0, or RAID 1 configuration. To create a RAID 10 configuration, you must use the Manual Configuration mode.

The following subsections explain how to use the Configuration Wizard to create storage configurations:

- [Section 7.1.1, “Understanding Virtual Disk Parameters”](#)
- [Section 7.1.2, “Using Auto Configuration”](#)
- [Section 7.1.3, “Using Guided Configuration”](#)
- [Section 7.1.4, “Using Manual Configuration: RAID 0”](#)
- [Section 7.1.5, “Using Manual Configuration: RAID 1”](#)
- [Section 7.1.6, “Using Manual Configuration: RAID 10”](#)

7.1.1 Understanding Virtual Disk Parameters

This section describes the Virtual Disk Parameters that you can set when you use the Guided Configuration or Manual Configuration modes of the Configuration Wizard. You should change these parameters only if you have a specific reason for doing so. It is usually best to leave them at their default settings.

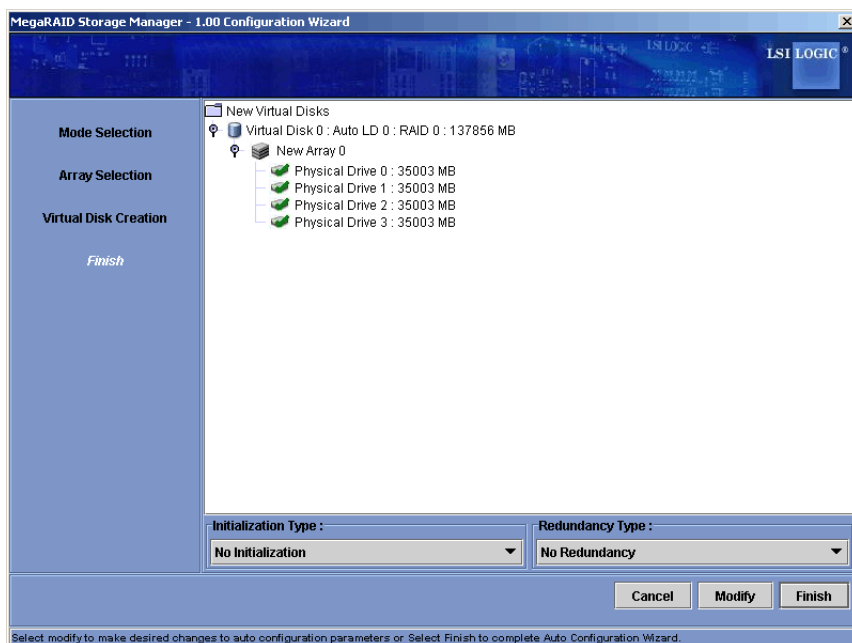
- **Stripe Size:** A stripe size of 64 Kbytes is supported.
- **Disk Cache Policy:** Select a cache setting for this disk: *Unchanged*, *Enabled*, or *Disabled*.
- **Init State:**
 - *No Initialization:* The new configuration is not initialized and the existing data on the disks is not overwritten.
 - *Fast Initialization:* MegaRAID Storage Manager software quickly writes zeroes to the first and last 8 Mbyte regions of the new virtual disk.
 - *Full Initialization:* A complete initialization is done on the new configuration. This may take a long time if the disks are large.

7.1.2 Using Auto Configuration

Auto Configuration is the quickest and simplest way to create a new storage configuration. When you select Auto Configuration mode on the first Configuration Wizard screen, the Configuration Wizard creates the best configuration possible using the available physical disks.

Figure 7.2 shows the Auto Configuration screen.

Figure 7.2 Auto Configuration Screen



Follow these steps to create a new storage configuration in Auto Configuration mode:

1. Select a redundancy option from the drop-down menu at the bottom of the Auto Configuration window:
 - **No Redundancy:** The new configuration will have no data redundancy (RAID 0). If a physical disk in the configuration fails, all data will be lost.

- **With Redundancy:** The new configuration will have data redundancy via mirrored data (RAID 1). If a physical disk fails, data is still protected.
2. Select an initialization option from the drop-down menu at the bottom of the window:
 - **No Initialization:** The new configuration is not initialized, and the existing data on the disks is not overwritten.
 - **Fast Initialization:** MegaRAID Storage Manager software quickly writes zeroes to the first and last 8 Mbyte regions of the new virtual disk.
 - **Full Initialization:** A complete initialization is done on the new configuration. This may take a long time if the disks are large.
 3. (Optional) Click **Modify** if you want to switch to Manual Configuration mode so you can modify the suggested Auto Configuration.

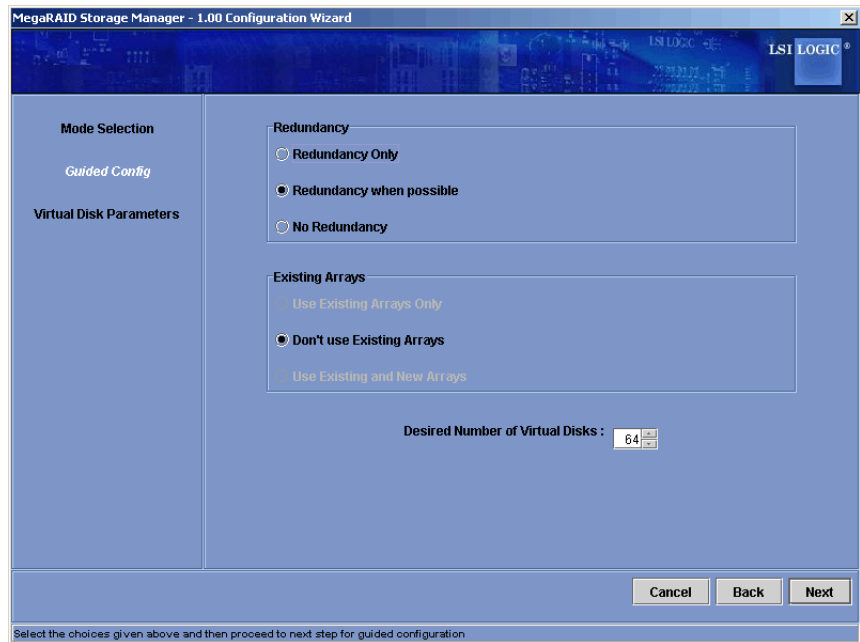
When you click **Modify**, the Virtual Disk Creation screen appears. Select the new virtual disk, and click **Reclaim**. Then select the new array from the Arrays with Free Space list, and change the virtual disk parameters as needed.
 4. Click **Finish**. The new storage configuration will be created and initialized (unless you selected **No Initialization**).

7.1.3 Using Guided Configuration

Guided Configuration provides an easy way to create a new storage configuration. Based on the information that is provided, the Configuration Wizard uses the available disk drives to create an optimal storage configuration.

[Figure 7.3](#) shows the first screen that appears when you select Guided Configuration.

Figure 7.3 First Guided Configuration Screen



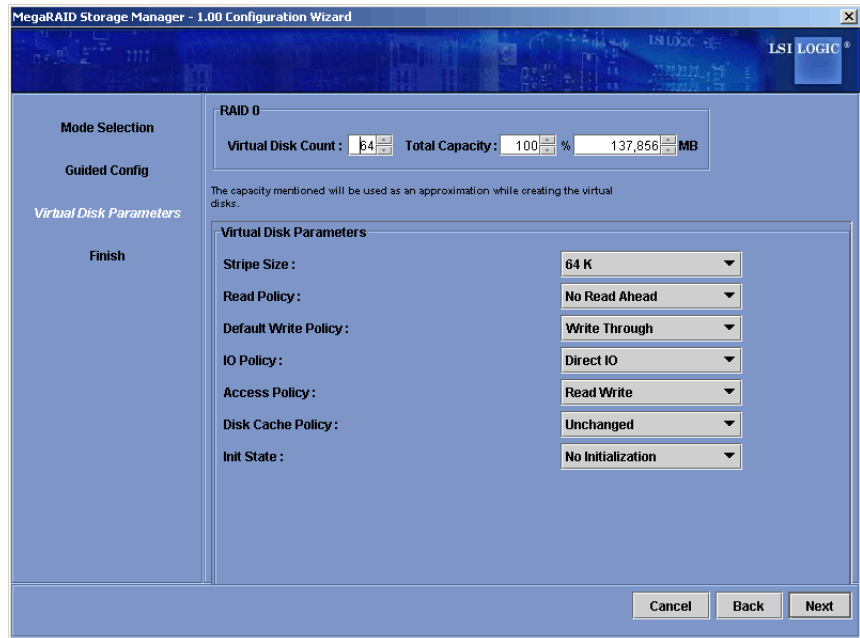
Follow these steps to create a new storage configuration in Guided Configuration mode:

1. Select a redundancy option at the top of the Guided Configuration window:
 - **Redundancy Only:** Create a configuration only if redundancy (RAID 1) is possible.
 - **Redundancy when possible:** Create a redundant configuration if possible. Otherwise, create a non-redundant configuration.
 - **No Redundancy:** Create a non-redundant configuration.
2. Choose whether you want to use existing arrays in the new virtual disk. The options are:
 - Use Existing Arrays Only
 - Don't Use Existing Arrays
 - Use Existing and New Arrays

The first and third options are disabled if there are no available existing arrays.

3. Select a maximum number of virtual disks to be created. The Configuration Wizard may not be able to create as many virtual disks as you want, depending on the current configuration and the number of virtual disks that have already been created.
4. Click **Next** to continue to the next window, as shown in [Figure 7.4](#).

Figure 7.4 Second Guided Configuration Screen



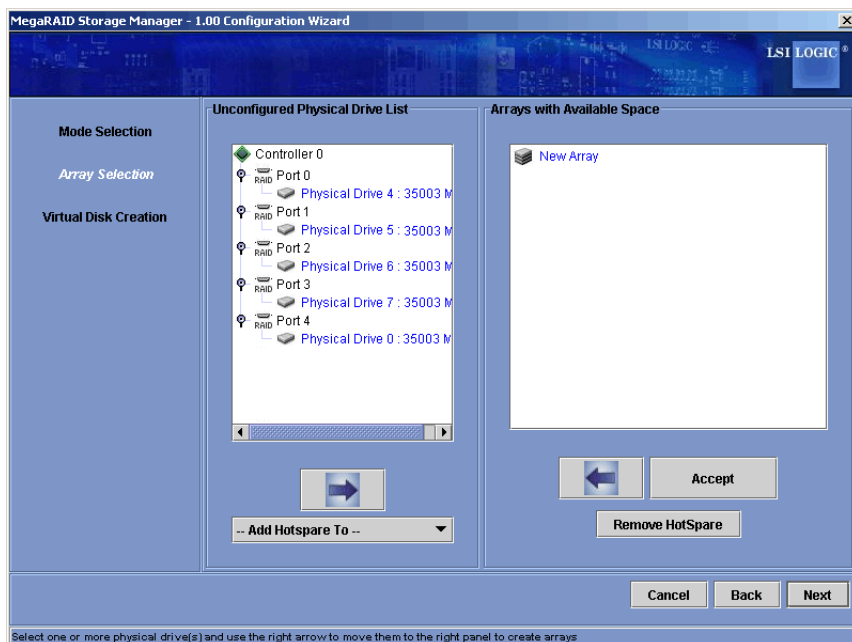
5. Change the default volume parameters in this window, if needed.
In the top section of the window you can specify the number of virtual disks to create. You can also choose to use less than the full capacity of this array for the virtual disk(s). (You could do this to leave capacity available for other virtual disks that you create later.) To learn about the Stripe Size and other virtual disk parameters, see [Section 7.1.1, "Understanding Virtual Disk Parameters,"](#) page 7-3.
6. Click **Next** to continue to the next window.
7. Check the configuration that you have just defined. If it is acceptable, click **Finish**. If you want to change something, click **Back** to return to the previous windows.

7.1.4 Using Manual Configuration: RAID 0

Follow these steps to create a RAID 0 storage configuration using the Manual Configuration mode of the Configuration Wizard.

Figure 7.5 shows the first screen that appears when you select Manual Configuration.

Figure 7.5 First Manual Configuration Screen



1. In the first Manual Configuration window, select two or more available drives in the left panel. Click the **Right Arrow** button to move the selected drives to the right panel.

Note: MegaRAID Storage Manager software will not allow you to select the disk drive on which the operating system is installed or any other drives that are already part of a configuration.

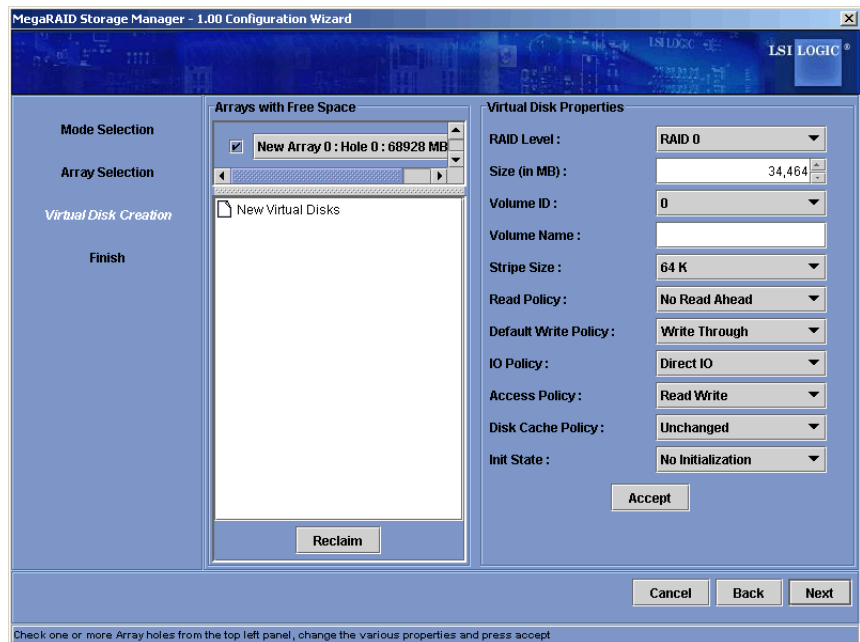
2. Click **Accept** to accept these drives for the new RAID 0 array.

Note: To remove a single drive from a proposed new array, select the drive icon in the right panel and click the **Left Arrow** button.

3. Click **Next**.

The next Configuration Wizard window appears, as shown in [Figure 7.6](#).

Figure 7.6 Manual Configuration – Defining a Virtual Disk



The *Arrays with Free Space* menu lists the new array that you just defined, plus any existing arrays with holes (free space) that could be used for a new configuration.

4. From the *Arrays with Free Space* menu, select the array to use for the new virtual disk.
5. In the right panel, select **RAID 0** as the RAID level.
6. (Optional) Set *Size (in MB)* to a lower number if you do not want to use the entire available capacity for the new virtual disk.
7. (Optional) Change the other Virtual Disk Properties, if necessary. For more information, see [Section 7.1.1, “Understanding Virtual Disk Parameters.”](#)

8. Click **Accept** to accept the configuration of the new virtual disk.

Note: Click the **Reclaim** button if you want to undo a virtual disk that you just defined.
9. Click **Next** to continue with the next configuration step.
The Virtual Disk Summary window appears.
10. Review the configuration shown in the Virtual Disk Summary window. If you want to change something, click **Back** and change the configuration parameters.
11. Click **Finish** to accept the configuration and start the initialization process (unless you selected **No Initialization** earlier).

7.1.5 Using Manual Configuration: RAID 1

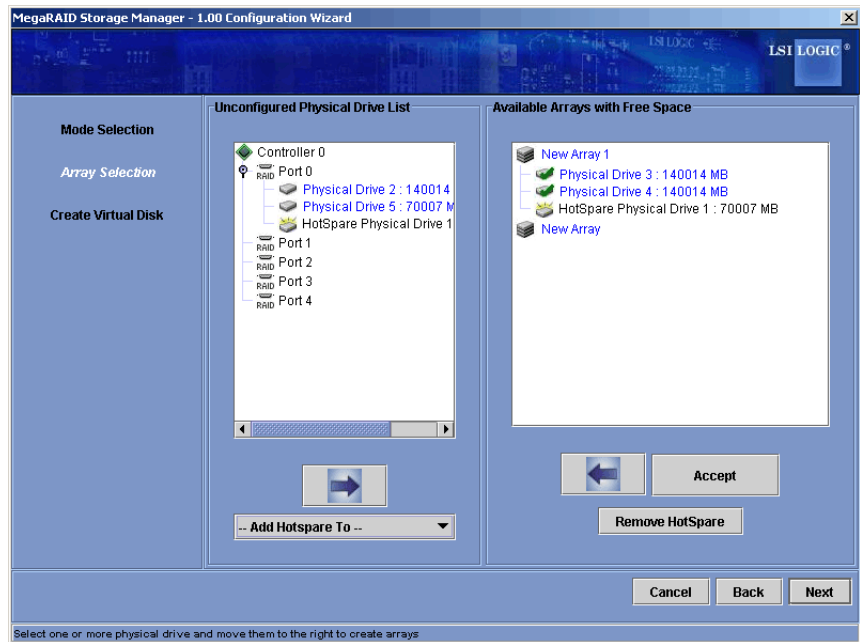
Follow these steps to create a RAID 1 storage configuration using the Manual Configuration mode of the Configuration Wizard:

1. In the first Manual Configuration window, shown in [Figure 7.5](#), select two available drives in the left panel. Click the **Right Arrow** button to move the selected drives to the right panel.

Note: MegaRAID Storage Manager software will not allow you to select the disk drive on which the operating system is installed or any other drives that are already part of a configuration.

2. Click **Accept** to accept these drives for the new RAID 1 array.
3. To add a hotspare to an array, select an available drive in the left panel. Select the array from the drop-down menu, and click **Add Hotspare To**, as shown in [Figure 7.7](#).

Figure 7.7 Manual Configuration – Adding a Hotspare



4. To remove a hotspare from an array, select it in the right panel and click **Remove HotSpare**.

5. Click **Next**.

The next Configuration Wizard window appears, as shown in [Figure 7.6](#).

The *Arrays with Free Space* menu lists the new array(s) that you just defined, plus any existing arrays with holes (free space) that could be used for a new configuration.

6. Select the array to use for the new virtual disk.

7. In the right panel, select RAID 1 as the RAID level.

8. (Optional) Set *Size (in MB)* to a lower number if you do not want to use the entire available capacity for the new virtual disk.

9. (Optional) Change the other Virtual Disk Properties, if necessary. For more information, see [Section 7.1.1, “Understanding Virtual Disk Parameters.”](#)

10. Click **Accept** to accept the configuration of the new virtual disk.

Note: Click the **Reclaim** button if you want to undo a virtual disk that you just defined.

11. Click **Next** to continue with the next configuration step.

The Virtual Disk Summary window appears.

12. Review the configuration shown in the window. If you want to change something, click **Back** and change the configuration parameters.
13. Click **Finish** to accept the configuration and start the initialization process (unless you selected **No Initialization** earlier).

7.1.6 Using Manual Configuration: RAID 10

Follow these steps to create a RAID 10 storage configuration using the Manual Configuration mode of the Configuration Wizard:

1. In the first Manual Configuration window, shown in [Figure 7.5](#), select two available drives in the left panel. Click the **Right Arrow** button to move the selected drives to the right panel.
2. Click **Accept** to accept these drives for a new RAID 1 array.
3. Select two more drives for a second RAID 1 array, and click **Accept**.
4. To add a hotspare, select an available drive in the left panel. Select the array from the drop-down menu, and click **Add Hotspare To**, as shown in [Figure 7.7](#).
5. To remove a hotspare from an array, select it in the right panel and click **Remove HotSpare**.
6. Click **Next**.

The next Configuration Wizard window appears, as shown in [Figure 7.6](#).

The *Arrays with Free Space* menu lists the new arrays that you just defined, plus any existing arrays with holes (free space) that could be used for a new configuration.

7. In the left panel, select the two RAID 1 arrays from the menu.
8. In the right panel, select RAID 10 as the RAID level.

For a RAID 10 array, the entire capacity of the array is automatically used for the new virtual disk. You cannot define another virtual disk on this array.

9. (Optional) Change the other Virtual Disk Properties, if necessary. For more information, see [Section 7.1.1, “Understanding Virtual Disk Parameters.”](#)
10. Click **Accept** to accept the configuration of the new virtual disk.

Note: Click the **Reclaim** button if you want to undo a virtual disk that you just defined.
11. Click **Next** to continue with the next configuration step.

The Virtual Disk Summary window appears.
12. Review the configuration shown in the window. If you want to change something, click **Back** and change the configuration parameters.
13. Click **Finish** to accept the configuration and start the initialization process (unless you selected **No Initialization** earlier).

7.2 Adding Hotspare Disks

Hotspares are disk drives that are available to automatically replace failed drives in a RAID 1 or RAID 10 virtual disk. Only global hotspares are supported for Embedded MegaRAID Software.

To add a global hotspare disk, follow these steps:

1. In the left panel of the MegaRAID Storage Manager window, right-click the icon of any unused disk drive.
2. Select **Make Global Hotspare**.

Make sure the capacity of the hotspare drive is equal to or larger than the capacity of the disks in the array and that it is the same type of drive (SAS or SATA).

Note: The hotspare drive will rebuild a failed drive even if it is SAS and the array drives are SATA, or vice versa. Once the rebuilt is completed, LSI recommends that you replace the new array member with a drive of the same type.

7.3 Changing Adjustable Task Rates

Follow these steps if you need to change the adjustable rates for rebuilds and other system tasks that run in the background:

Note: LSI recommends that you leave the adjustable task rates at their default settings to achieve the best system performance. If you raise the task rates above the defaults, foreground tasks will run more slowly and it may seem that the system is not responding. If you lower the task rates below the defaults, rebuilds and other background tasks may run very slowly and may not complete within a reasonable time. If you decide to change the values, record the original default value here so you can restore them later, if necessary:

Rebuild Rate: _____

Background Initialization (BGI) Rate: _____

Check Consistency Rate: _____

1. Select the **Physical View** tab in the left panel of the MegaRAID Storage Manager window, and select a controller icon.
2. In the right panel of the MegaRAID Storage Manager window, select the **Operations** tab, and select **Set Adjustable Task Rates**.

The task rates appear in the right panel.

3. Enter changes, as needed, to the task rates for Rebuild Rate, Background Initialization (BGI) Rate (for fast initialization), and Check Consistency Rate (for consistency checks). Each task rate can be set from 0 to 100. The higher the number, the faster the activity will run in the background, possibly impacting other system tasks.
4. Click **Go** to accept the new task rates.
5. When the warning message appears, click **OK** to confirm that you want to change the task rates.

7.4 Changing Virtual Disk Properties

You can change a virtual disk's Read Policy, Write Policy, and other properties at any time after the virtual disk is created. To do this, follow these steps:

1. Select a virtual disk icon in the left panel of the MegaRAID Storage Manager window.
2. In the right panel, select the **Properties** tab, and then select **Set Virtual Disk Properties**.

A list of Virtual Disk Properties appears in the right panel.

3. Change the virtual disk properties as needed in the right panel. For information on these properties, see [Section 7.1.1, "Understanding Virtual Disk Parameters," page 7-3](#).

Note: Only the Disk Write Cache and Read Ahead functions are supported in Embedded MegaRAID Software.

4. Click **Go** to accept the changes.

7.5 Deleting a Virtual Disk

Caution: Be sure to back up the data on the virtual disk before you delete it. Be sure that the operating system is not installed on this virtual disk.

You can delete virtual disks to rearrange the storage space. To delete a virtual disk, follow these steps:

1. Back up all user data that is on the virtual disk you intend to delete.
2. In the left panel of the MegaRAID Storage Manager window, select the **Logical** tab, and click the icon of the virtual disk you want to delete.
3. In the right panel, select the **Operations** tab, and select **Delete Virtual Disk**.
4. Click **Go**.
5. When the warning message appears, click **Yes** to confirm that you want to delete the virtual disk.

7.6 Saving a Storage Configuration to Disk

You can save an existing controller configuration to a file so you can apply it to another controller. To save a configuration file, follow these steps:

1. Select a controller icon in the left panel of the MegaRAID Storage Manager window.
2. On the menu bar, select **Operations -> Advanced Operations -> Configuration -> Save Configuration**.

The Save dialog box appears.

3. In the Save dialog box, type a name for the configuration file, or accept the default name (`hostname.cfg`).
4. Click **Save** to save the configuration file.

7.7 Clearing a Storage Configuration from a Controller

You can use the Add New Configuration option to add a new storage configuration while keeping the existing configuration. Alternatively, you can clear the existing storage configuration from a controller and then create a totally new configuration or load a previously saved configuration file.

Caution: Before you clear a configuration, be sure to save any data that you want to keep. Clearing a configuration deletes all data from the disks of the existing configuration. Be sure that the operating system is not installed on this configuration.

To clear a configuration from a controller, follow these steps:

1. Select a controller icon in the left panel of the MegaRAID Storage Manager window.
2. On the menu bar, select **Operations -> Advanced Operations -> Configuration -> Clear Configuration**.

A Warning message appears.

3. Click **Yes** to clear the configuration or **No** to cancel the operation.

7.8 Adding a Saved Storage Configuration

When you replace a controller, or when you want to duplicate an existing storage configuration on a new controller, you can add a saved configuration to the controller.

Caution: When you add a saved configuration to a replacement controller, be sure that the number and size of the physical disks connected to the controller are exactly the same as when the configuration was saved.

To add a saved configuration, follow these steps:

1. Select a controller icon in the left panel of the MegaRAID Storage Manager window.
2. On the menu bar, select **Operations -> Advanced Operations -> Configuration -> Add Saved Configuration**.
A Warning message appears.
3. Click **Yes**.
4. When the Open dialog box appears, select the configuration file, and click **Open**.
5. View the configuration detail, then select **Apply**.
6. Confirm the new configuration when prompted.

Chapter 8

Monitoring System Events and Storage Devices

The MegaRAID Storage Manager software enables you to monitor the status of disk drives, virtual disks, and other storage devices. This chapter explains how to use MegaRAID Storage Manager software to perform the following monitoring tasks:

- [Section 8.1, “Monitoring System Events”](#)
 - [Section 8.2, “Monitoring Controllers”](#)
 - [Section 8.3, “Monitoring Disk Drives”](#)
 - [Section 8.4, “Monitoring Virtual Disks”](#)
 - [Section 8.5, “Monitoring Rebuilds and Other Processes”](#)
-

8.1 Monitoring System Events

MegaRAID Storage Manager software monitors the activity and performance of all controllers in the system and the storage devices connected to them. When an event occurs (such as the creation of a new virtual disk or the removal of a physical drive) an event message appears in the log displayed at the bottom of the MegaRAID Storage Manager window.


Each event in the log includes an error level (Information, Warning, Caution, Fatal, or Dead) a date and timestamp, and a brief description. (For a list of all events, see [Appendix A, “Events and Messages.”](#))

The Log menu has three options:

- **Save Log:** Saves the current log to a file.
- **Clear Log:** Clears the current log information.
- **Load Log:** Enables you to load a different log file.

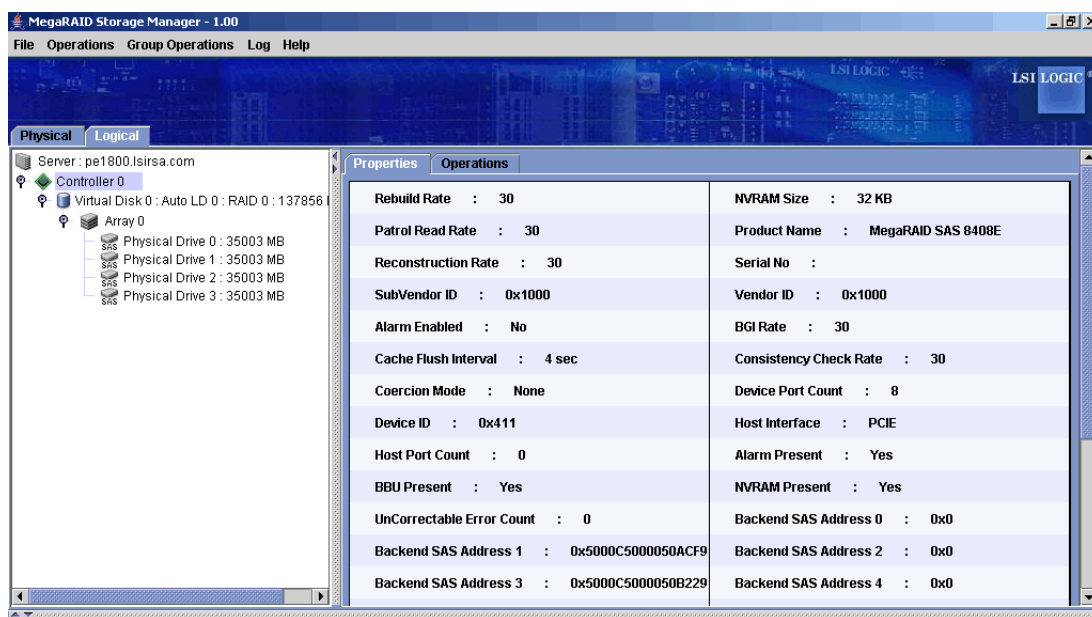
8.2 Monitoring Controllers

Note: The Embedded MegaRAID Software drivers act as virtual “controllers.” Because these are not actual hardware storage controllers installed in the computer system, some of the controller properties shown in the screen below do not apply to them.

When MegaRAID Storage Manager software is running, you can see the status of all controllers in the left panel of the MegaRAID Storage Manager window. If the controller is operating normally, the controller icon looks like this: . If the controller has failed, a small red circle appears to the right of the icon. (See [Section 6.2.1, “Physical/Logical View Panel”](#) for a complete list of device icons.)

To display complete controller information, click a controller icon in the left panel of the MegaRAID Storage Manager window, and click the **Properties** tab in the right panel. [Figure 8.1](#) shows the Controller Information window.

Figure 8.1 Controller Information





Most of the information on this screen is self-explanatory. Note the following:

- The *Rebuild Rate*, *Consistency Check Rate*, and *BGI Rate* (background initialization) are all user selectable. For more information, see [Section 7.3, “Changing Adjustable Task Rates,” page 7-14](#).
- The *BBU Present* field indicates whether a battery backup unit is installed.

The *Alarm Present* and *Alarm Enabled* fields indicate whether the controller has an alarm to alert the user with an audible tone when there is an error or problem on the controller. There are options on the controller Properties tab for silencing or disabling the alarm.

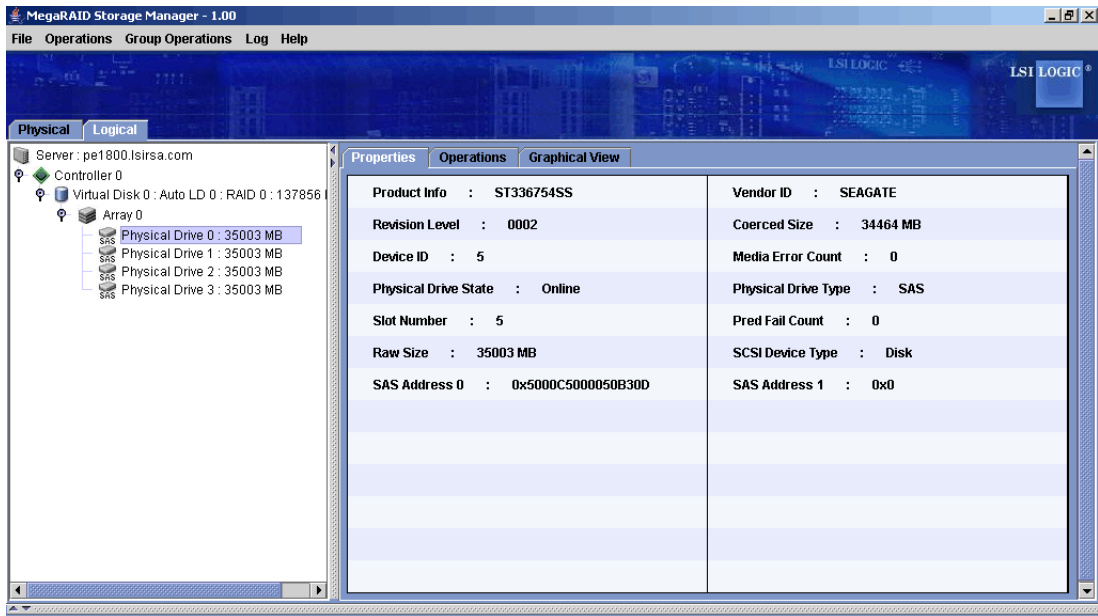
8.3 Monitoring Disk Drives

When MegaRAID Storage Manager software is running, you can see the status of all physical disk drives in the left panel of the MegaRAID Storage Manager window. If the disk drive is operating normally, its icon looks like this: . If the disk drive has failed, a small red circle appears to the right of the icon, like this: . (See [Section 6.2.1, “Physical/Logical View Panel”](#) for a complete list of device icons.)

To display complete disk drive information, click a disk drive icon in the left panel of the MegaRAID Storage Manager window, and click the **Properties** tab in the right panel.

[Figure 8.2](#) shows the Properties panel for a physical drive.

Figure 8.2 Physical Drive Information



The information on this panel is self-explanatory. There are no user-selectable properties for physical devices. Icons for other storage devices such as CD-ROM drives and DAT drives may also appear in the left panel.

The next release of Embedded MegaRAID Software will enable you to identify which physical drive is represented by a disk icon on the left by blinking the drive's LED. (This will work only for drives that are in a disk enclosure.) The procedure for doing this is as follows:



1. Click the physical disk icon in the left panel.
2. Click the **Operations** tab in the right panel.
3. Select **Locate Physical Drive**, and click **Go**.

The LED on the physical disk drive in the enclosure starts blinking to show its location.

4. To stop the disk drive light from blinking, select **Stop Locating Physical Drive**, and click **Go**.

To display a graphical view of a disk drive, click on a drive icon in the left panel of the MegaRAID Storage Manager window, and click the **Graphical View** tab. In Graphical View, the drive's storage capacity is color coded according to the legend shown on the screen: configured space is blue, available space is white, and reserved space is red. When you select a virtual disk from the drop-down menu, the disk space used by that virtual disk is displayed in green.

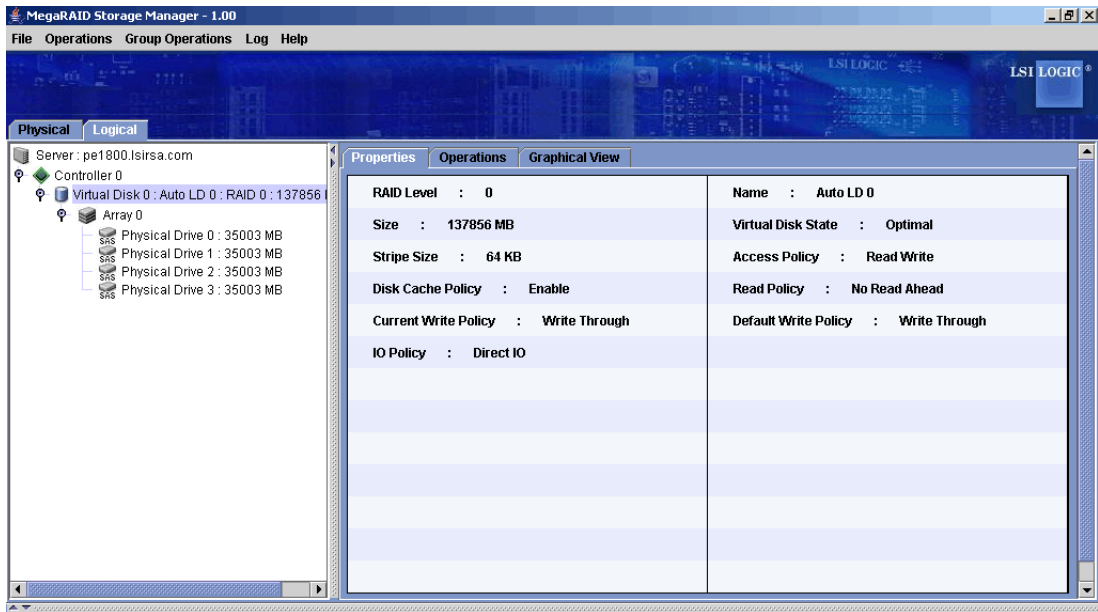
8.4 Monitoring Virtual Disks

When MegaRAID Storage Manager software is running, you can see the status of all virtual disks. If a virtual disk is operating normally, the icon looks like this: . If the virtual disk is running in Degraded mode (for example, if a physical disk has failed) a small yellow circle appears to the right of the icon: .

When the Logical tab is selected, the left panel of the MegaRAID Storage Manager window shows which physical disks are used by each virtual disk. The same physical disk can be used by multiple virtual disks.

To display complete virtual disk information, click the **Logical** tab in the left panel, click on a virtual disk icon in the left panel, and click the **Properties** tab in the right panel. [Figure 8.3](#) shows the Properties panel for a virtual disk.

Figure 8.3 Virtual Disk Properties



The RAID level, stripe size, and access policy of the virtual disk are set when it is configured.

Note: You can change the read policy, write policy, and other virtual disk properties by selecting **Operations->Set Virtual Disk Properties**.

The next release of Embedded MegaRAID Software will enable you to identify which physical drives are used in a virtual disk by blinking the drive LEDs. (This will work only for drives that are in a disk enclosure.) The procedure for doing this is as follows:

1. Click the virtual disk icon in the left panel.
2. Click the **Operations** tab in the right panel.
3. Select **Locate Virtual Disk**, and click **Go**.

The LEDs on the physical disk drives in the virtual disk start blinking (except for hotspare drives).

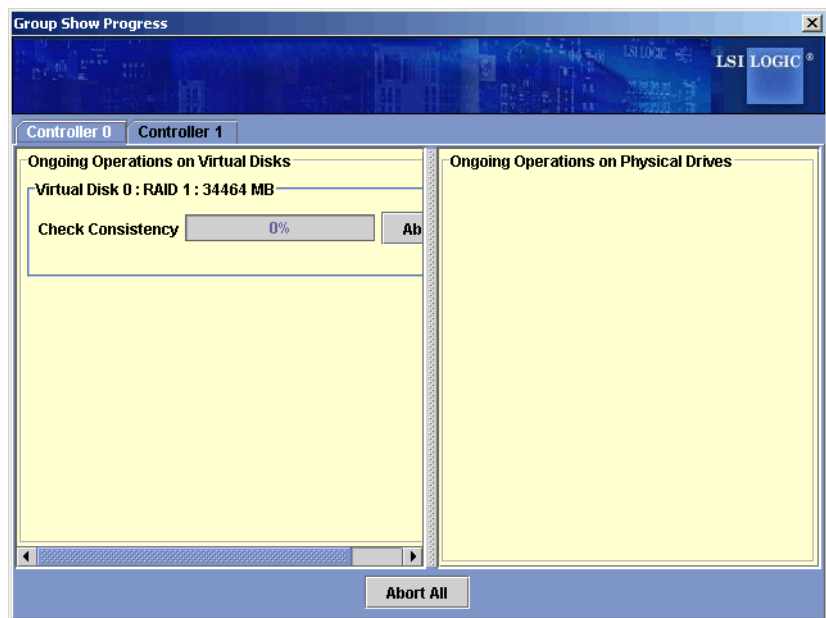
4. To stop the LEDs from blinking, select **Stop Locating Virtual Disk**, and click **Go**.

To display a graphical view of a virtual disk, click on a virtual disk icon in the left panel of the MegaRAID Storage Manager window, and click the **Graphical View** tab. In Graphical View, the disk group (array) used for this virtual disk is shaded blue to show how much of the disk group capacity is used by this virtual disk. If part of the disk group is shaded white, this indicates that some of the capacity is used by another virtual disk. In a RAID 10 configuration, two disk groups are used by one virtual disk.

8.5 Monitoring Rebuilds and Other Processes

MegaRAID Storage Manager software allows you to monitor the progress of rebuilds and other lengthy processes in the Group Show Progress window. Open this window, shown in [Figure 8.4](#) by selecting **Group Operations->Show Progress** on the menu bar.

Figure 8.4 Group Show Progress Window



Operations on virtual disks appear in the left panel of the Group Show Progress window, and operations on physical drives appear in the right panel. The following operations appear in this window:

- Background or foreground initialization of a virtual disk
- Rebuild (see [Section 9.3, “Rebuilding a Drive”](#))
- Consistency check (see [Section 9.2, “Running a Consistency Check”](#))

To abort an ongoing process, click the **Abort** button next to the status indicator. Click **Abort All** to abort all ongoing processes. Click **Close** to close the window.

Chapter 9

Maintaining and Managing Storage Configurations

This section explains how to use MegaRAID Storage Manager software to maintain and manage storage configurations. This chapter explains how to perform the following tasks:

- [Section 9.1, “Initializing a Virtual Disk”](#)
 - [Section 9.2, “Running a Consistency Check”](#)
 - [Section 9.3, “Rebuilding a Drive”](#)
 - [Section 9.4, “Making a Drive Offline”](#)
-

9.1 Initializing a Virtual Disk

To initialize a virtual disk after completing the configuration process, follow these steps:

1. Select the **Logical** tab in the left panel of the MegaRAID Storage Manager window, and click the icon of the virtual disk that you want to initialize.
2. Select **Group Operations->Initialize**.
The Group Initialize dialog box appears.
3. Select the virtual disk(s) to initialize.

Caution: Initialization erases all data on the virtual disk. Be sure to back up any data you want to keep before you initialize. Be sure the operating system is not installed on the virtual disk you are initializing.

4. Select the **Fast Initialization** check box if you want to use this option. If you leave the box unchecked, MegaRAID Storage Manager software will run a Full Initialization on the virtual disk. (For more

information, see [Section 7.1.1, “Understanding Virtual Disk Parameters.”](#))

5. Click **Start** to begin the initialization.

You can monitor the progress of the initialization. See [Section 8.5, “Monitoring Rebuilds and Other Processes”](#) for more information.

9.2 Running a Consistency Check

You should periodically run a consistency check on fault-tolerant virtual disks. It is especially important to do this if you suspect that the virtual disk consistency data may be corrupted. Be sure to back up the data before running a consistency check, if you think the consistency data may be corrupted.

To run a consistency check, follow these steps:

1. Select **Group Operations->Check Consistency**.

The Group Consistency Check window appears.

2. Select the virtual disks that you want to check, or click **Select All** to select all virtual disks.
3. Click **Start** to begin.



You can monitor the progress of the consistency check. See [Section 8.5, “Monitoring Rebuilds and Other Processes”](#) for more information.

Note: You can also run a consistency check by selecting the virtual disk icon in the left panel of the MegaRAID Storage Manager window and selecting the option on the Operation tab in the right panel.

9.3 Rebuilding a Drive

If a single drive in a RAID 1 or RAID 10 virtual disk fails, the system is protected from data loss. The failed drive must be replaced, and the drive's data must be rebuilt on a new drive to restore the system to fault tolerance. (You can choose to rebuild the data on the failed drive if the

drive is still operational.) If hotspare disks are available, the failed drive is rebuilt automatically without any user intervention.

If a drive has failed, a red circle appears to the right of the disk drive icon: . A small yellow circle appears to the right of the icon of the virtual disk that uses this physical disk: . This indicates that the virtual disk is in a degraded state; the data is still safe, but data could be lost if another drive fails.

Follow these steps if you need to rebuild a physical drive:

1. Right-click the icon of the failed drive, and select **Rebuild**.
2. Click **Yes** when the warning message appears. If the drive is still good, a rebuild will start.

You can monitor the progress of the rebuild in the Group Show Progress window by selecting **Group Operations->Show Progress**. If the drive cannot be rebuilt, an error message appears. Continue with the next step.
3. Shut down the system, disconnect the power cord, and open the computer case.
4. Replace the failed disk drive with a new drive of equal capacity.
5. Close the computer case, reconnect the power cord, and restart the computer.
6. Restart the MegaRAID Storage Manager software.

When the new drive spins up, the drive icon changes back to normal status, and the rebuild process begins automatically. You can monitor the progress of the rebuild in the Group Show Progress window by selecting **Group Operations->Show Progress**.

9.4 Making a Drive Offline

If a disk drive is currently part of a redundant configuration and you want to use it in another configuration, you can use MegaRAID Storage Manager commands to remove the disk drive from the first configuration. When you do this, *all data on that drive is lost*.

To remove the disk drive from the configuration without harming the data on the virtual disk, follow these steps:

1. In the left panel of the MegaRAID Storage Manager window, right-click the icon of a disk drive in a redundant virtual disk.
2. Select **Make drive offline** from the pop-up menu. The disk drive status changes to Offline.
3. Select **File->Rescan**. The disk drive status remains as Offline. At this point, the data on this disk drive is no longer valid.
4. If necessary, create a hotspare disk for the virtual disk from which you removed the disk drive. (See [Section 7.2, “Adding Hotspare Disks.”](#))

When a hotspare is available, the data on the virtual disk will be rebuilt. You can now use the removed disk for another configuration.

Caution: If MegaRAID Storage Manager software detects that a disk drive in a virtual disk has failed, it makes the drive Offline. If this happens, you must remove the disk drive and replace it. You cannot make the drive usable for another configuration by using the **Rescan** command.

Appendix A

Events and Messages

This appendix lists the MegaRAID Storage Manager software events that may appear in the event log.

MegaRAID Storage Manager software monitors the activity and performance of all controllers in the workstation and the devices attached to them. When an event occurs, such as the start of an initialization, an event message appears in the log at the bottom of the MegaRAID Storage Manager window.

Note: MegaRAID Storage Manager software can be used to manage a wide range of MegaRAID controllers. Some of the events and messages listed in this appendix are not applicable to Embedded MegaRAID Software.

Each message that appears in the event log has an error level that indicates the severity of the event, as shown in [Table A.1](#).

Table A.1 Event Error Levels

Error Level	Meaning
Information	Informational message; no user action is necessary.
Warning	Some component may be close to a failure point.
Caution	A component has failed, but the system has not lost data.
Fatal	A component has failed, and data loss has occurred or will occur.
Dead	A catastrophic error has occurred, and the controller has died. This event is seen only after the controller has been restarted.

[Table A.2](#) lists all of the MegaRAID Storage Manager software event messages. The event message descriptions include placeholders for specific values that are determined when the event is generated. Some of the error messages are relevant only for hardware RAID.

Table A.2 Event Messages

Number (Hex)	Number (Decimal)	Type	Event Text
0x0000	0	Information	Firmware initialization started (PCI ID %04x/%04x/%04x/%04x)
0x0001	1	Information	Firmware version %s
0x0002	2	Fatal	Unable to recover cache data from TBBU
0x0003	3	Information	Cache data recovered from TBBU successfully
0x0004	4	Information	Configuration cleared
0x0005	5	Warning	Cluster down; communication with peer lost
0x0006	6	Information	%s ownership changed from %02x to %02x
0x0007	7	Information	Alarm disabled by user
0x0008	8	Information	Alarm enabled by user
0x0009	9	Information	Background initialization rate changed to %d%%
0x000a	10	Fatal	Controller cache discarded due to memory/battery problems
0x000b	11	Fatal	Unable to recover cache data due to configuration mismatch
0x000c	12	Information	Cache data recovered successfully
0x000d	13	Fatal	Controller cache discarded due to firmware version incompatibility
0x000e	14	Information	Consistency Check rate changed to %d%%
0x000f	15	Dead	Fatal firmware error: %s
0x0010	16	Information	Factory defaults restored
0x0011	17	Information	Flash downloaded image corrupt
0x0012	18	Caution	Flash erase error
0x0013	19	Caution	Flash timeout during erase
0x0014	20	Caution	Flash error
0x0015	21	Information	Flashing image: %s
0x0016	22	Information	Flash of new firmware image(s) complete
0x0017	23	Caution	Flash programming error
0x0018	24	Caution	Flash timeout during programming
0x0019	25	Caution	Flash chip type unknown
0x001a	26	Caution	Flash command set unknown
0x001b	27	Caution	Flash verify failure
0x001c	28	Information	Flush rate changed to %d seconds
0x001d	29	Information	Hibernate command received from host
(Sheet 1 of 9)			

Table A.2 Event Messages (Cont.)

Number (Hex)	Number (Decimal)	Type	Event Text
0x001e	30	Information	Event log cleared
0x001f	31	Information	Event log wrapped
0x0020	32	Dead	Multi-bit ECC error: ECAR=%x, ELOG=%x, (%s)
0x0021	33	Warning	Single-bit ECC error: ECAR=%x, ELOG=%x, (%s)
0x0022	34	Dead	Not enough controller memory
0x0023	35	Information	Patrol Read complete
0x0024	36	Information	Patrol Read paused
0x0025	37	Information	Patrol Read Rate changed to %d%%
0x0026	38	Information	Patrol Read resumed
0x0027	39	Information	Patrol Read started
0x0028	40	Information	Rebuild rate changed to %d%%
0x0029	41	Information	Reconstruction rate changed to %d%%
0x002a	42	Information	Shutdown command received from host
0x002b	43	Information	Test event: %s
0x002c	44	Information	Time established as %s; (%d seconds since power on)
0x002d	45	Information	User entered firmware debugger
0x002e	46	Warning	Background Initialization aborted on %s
0x002f	47	Warning	Background Initialization corrected medium error (%s at %lx
0x0030	48	Information	Background Initialization completed on %s
0x0031	49	Fatal	Background Initialization corrected medium error (%s at %lx, %s at %lx)
0x0032	50	Fatal	Background Initialization detected uncorrectable double medium errors (%s at %lx on %s)
0x0033	51	Caution	Background Initialization failed on %s
0x0034	52	Progress	Background Initialization progress on %s is %s
0x0035	53	Information	Background Initialization started on %s
0x0036	54	Information	Policy change on %s from %s to %s
0x0038	56	Warning	Consistency Check aborted on %s
0x0039	57	Warning	Consistency Check corrected medium error (%s at %lx, %s at %lx)
0x003a	58	Information	Consistency Check done on %s
0x003b	59	Information	Consistency Check done with corrections on %s, (corrections=%d)
(Sheet 2 of 9)			

Table A.2 Event Messages (Cont.)

Number (Hex)	Number (Decimal)	Type	Event Text
0x003c	60	Fatal	Consistency Check detected uncorrectable double medium errors (%s at %lx on %s)
0x003d	61	Caution	Consistency Check failed on %s
0x003e	62	Fatal	Consistency Check failed with uncorrectable data on %s
0x003f	63	Warning	Consistency Check found inconsistent parity on %s at strip %lx
0x0040	64	Warning	Consistency Check inconsistency logging disabled on %s (too many inconsistencies)
0x0041	65	Progress	Consistency Check progress on %s is %s
0x0042	66	Information	Consistency Check started on %s
0x0043	67	Warning	Initialization aborted on %s
0x0044	68	Caution	Initialization failed on %s
0x0045	69	Progress	Initialization progress on %s is %s
0x0046	70	Information	Fast initialization started on %s
0x0047	71	Information	Full initialization started on %s
0x0048	72	Information	Initialization complete on %s
0x0049	73	Information	Properties updated to %s (from %s)
0x004a	74	Information	Reconstruction complete on %s
0x004b	75	Fatal	Reconstruction of %s stopped due to unrecoverable errors
0x004c	76	Fatal	Reconstruct detected uncorrectable double medium errors (%s at %lx on %s at %lx)
0x004d	77	Progress	Reconstruction progress on %s is %s
0x004e	78	Information	Reconstruction resumed on %s
0x004f	79	Fatal	Reconstruction resume of %s failed due to configuration mismatch
0x0050	80	Information	Reconstructing started on %s
0x0051	81	Information	State change on %s from %s to %s
0x0052	82	Information	Clear aborted on %s
0x0053	83	Caution	Clear failed on %s (Error %02x)
0x0054	84	Progress	Clear progress on %s is %s
0x0055	85	Information	Clear started on %s
0x0056	86	Information	Clear completed on %s
0x0057	87	Warning	Error on %s (Error %02x)
(Sheet 3 of 9)			

Table A.2 Event Messages (Cont.)

Number (Hex)	Number (Decimal)	Type	Event Text
0x0058	88	Information	Format complete on %s
0x0059	89	Information	Format started on %s
0x005a	90	Caution	Hot Spare SMART polling failed on %s (Error %02x)
0x005b	91	Information	Inserted: %s
0x005c	92	Warning	%s is not supported
0x005d	93	Warning	Patrol Read corrected medium error on %s at %lx
0x005e	94	Progress	Patrol Read progress on %s is %s
0x005f	95	Fatal	Patrol Read found an uncorrectable medium error on %s at %lx
0x0060	96	Caution	Predictive failure: %s
0x0061	97	Fatal	Puncturing bad block on %s at %lx
0x0062	98	Information	Rebuild aborted by user on %s
0x0063	99	Information	Rebuild complete on %s
0x0064	100	Information	Rebuild complete on %s
0x0065	101	Caution	Rebuild failed on %s due to source drive error
0x0066	102	Caution	Rebuild failed on %s due to target drive error
0x0067	103	Progress	Rebuild progress on %s is %s
0x0068	104	Information	Rebuild resumed on %s
0x0069	105	Information	Rebuild started on %s
0x006a	106	Information	Rebuild automatically started on %s
0x006b	107	Caution	Rebuild stopped on %s due to loss of cluster ownership
0x006c	108	Fatal	Reassign write operation failed on %s at %lx
0x006d	109	Fatal	Unrecoverable medium error during rebuild on %s at %lx
0x006e	110	Information	Corrected medium error during recovery on %s at %lx
0x006f	111	Fatal	Unrecoverable medium error during recovery on %s at %lx
0x0070	112	Information	Removed: %s
0x0071	113	Warning	Unexpected sense: %s, CDB%s, Sense: %s
0x0072	114	Information	State change on %s from %s to %s
0x0073	115	Information	State change by user on %s from %s to %s
0x0074	116	Warning	Redundant path to %s broken
0x0075	117	Information	Redundant path to %s restored
(Sheet 4 of 9)			

Table A.2 Event Messages (Cont.)

Number (Hex)	Number (Decimal)	Type	Event Text
0x0076	118	Information	Dedicated Hot Spare PD %s no longer useful due to deleted array
0x0077	119	Caution	SAS topology error: Loop detected
0x0078	120	Caution	SAS topology error: Unaddressable device
0x0079	121	Caution	SAS topology error: Multiple ports to the same SAS address
0x007a	122	Caution	SAS topology error: Expander error
0x007b	123	Caution	SAS topology error: SMP timeout
0x007c	124	Caution	SAS topology error: Out of route entries
0x007d	125	Caution	SAS topology error: Index not found
0x007e	126	Caution	SAS topology error: SMP function failed
0x007f	127	Caution	SAS topology error: SMP CRC error
0x0080	128	Caution	SAS topology error: Multiple subtractive
0x0081	129	Caution	SAS topology error: Table to table
0x0082	130	Caution	SAS topology error: Multiple paths
0x0083	131	Fatal	Unable to access device %s
0x0084	132	Information	Dedicated Hot Spare created on %s (%s)
0x0085	133	Information	Dedicated Hot Spare %s (%s) disabled
0x0086	134	Caution	Dedicated Hot Spare %s no longer useful for all arrays
0x0087	135	Information	Global Hot Spare created on %s (%s)
0x0088	136	Information	Global Hot Spare %s (%s) disabled
0x0089	137	Caution	Global Hot Spare %s does not cover all arrays
0x008a	138	Information	Created %s
0x008b	139	Information	Deleted %s
0x008c	140	Information	Marking %s inconsistent due to active writes at shutdown
0x008d	141	Information	Battery Present
0x008e	142	Warning	Battery Not Present
0x008f	143	Information	New Battery Detected
0x0090	144	Information	Battery has been replaced
0x0091	145	Caution	Battery temperature is high
0x0092	146	Warning	Battery voltage low
0x0093	147	Information	Battery started charging
(Sheet 5 of 9)			

Table A.2 Event Messages (Cont.)

Number (Hex)	Number (Decimal)	Type	Event Text
0x0094	148	Information	Battery is discharging
0x0095	149	Information	Battery temperature is normal
0x0096	150	Fatal	Battery needs replacement - SOH Bad
0x0097	151	Information	Battery relearn started
0x0098	152	Information	Battery relearn in progress
0x0099	153	Information	Battery relearn completed
0x009a	154	Caution	Battery relearn timed out
0x009b	155	Information	Battery relearn pending: Battery is under charge
0x009c	156	Information	Battery relearn postponed
0x009d	157	Information	Battery relearn will start in 4 days
0x009e	158	Information	Battery relearn will start in 2 day
0x009f	159	Information	Battery relearn will start in 1 day
0x00a0	160	Information	Battery relearn will start in 5 hours
0x00a1	161	Information	Battery removed
0x00a2	162	Information	Current capacity of the battery is below threshold
0x00a3	163	Information	Current capacity of the battery is above threshold
0x00a4	164	Information	Enclosure (SES) discovered on %s
0x00a5	165	Information	Enclosure (SAFTE) discovered on %s
0x00a6	166	Caution	Enclosure %s communication lost
0x00a7	167	Information	Enclosure %s communication restored
0x00a8	168	Caution	Enclosure %s fan %d failed
0x00a9	169	Information	Enclosure %s fan %d inserted
0x00aa	170	Caution	Enclosure %s fan %d removed
0x00ab	171	Caution	Enclosure %s power supply %d failed
0x00ac	172	Information	Enclosure %s power supply %d inserted
0x00ad	173	Caution	Enclosure %s power supply %d removed
0x00ae	174	Caution	Enclosure %s EMM %d failed
0x00af	175	Information	Enclosure %s EMM %d inserted
0x00b0	176	Caution	Enclosure %s EMM %d removed
0x00b1	177	Warning	Enclosure %s temperature sensor %d below warning threshold
(Sheet 6 of 9)			

Table A.2 Event Messages (Cont.)

Number (Hex)	Number (Decimal)	Type	Event Text
0x00b2	178	Caution	Enclosure %s temperature sensor %d below error threshold
0x00b3	179	Warning	Enclosure %s temperature sensor %d above warning threshold
0x00b4	180	Caution	Enclosure %s temperature sensor %d above error threshold
0x00b5	181	Caution	Enclosure %s shutdown
0x00b6	182	Warning	Enclosure %s not supported; too many enclosures connected to port
0x00b7	183	Caution	Enclosure %s firmware mismatch (EMM %d)
0x00b8	184	Warning	Enclosure %s sensor %d bad
0x00b9	185	Caution	Enclosure %s phy bad for slot %d
0x00ba	186	Caution	Enclosure %s is unstable
0x00bb	187	Caution	Enclosure %s hardware error
0x00bc	188	Caution	Enclosure %s not responding
0x00bd	189	Information	SAS/SATA mixing not supported in enclosure; %s disabled
0x00be	190	Information	Enclosure (SES) hotplug on %s was detected, but is not supported
0x00bf	191	Information	Clustering enabled
0x00c0	192	Information	Clustering disabled
0x00c1	193	Information	PD too small to be used for auto-rebuild on %s
0x00c2	194	Information	BBU enabled; changing WT virtual disks to WB
0x00c3	195	Warning	BBU disabled; changing WB virtual disks to WT
0x00c4	196	Warning	Bad block table on %s is 80% full
0x00c5	197	Fatal	Bad block table on %s is full; unable to log block %lx
0x00c6	198	Information	Consistency Check Aborted Due to Ownership Loss on %s
0x00c7	199	Information	Background Initialization (BGI) Aborted Due to Ownership Loss on %s
0x00c8	200	Caution	Battery/charger problems detected; SOH Bad
0x00c9	201	Warning	Single-bit ECC error: ECAR=%x, ELOG=%x, (%s); warning threshold exceeded
0x00ca	202	Caution	Single-bit ECC error: ECAR=%x, ELOG=%x, (%s); critical threshold exceeded
0x00cb	203	Caution	Single-bit ECC error: ECAR=%x, ELOG=%x, (%s); further reporting disabled
0x00cc	204	Caution	Enclosure %s Power supply %d switched off
(Sheet 7 of 9)			

Table A.2 Event Messages (Cont.)

Number (Hex)	Number (Decimal)	Type	Event Text
0x00cd	205	Information	Enclosure %s Power supply %d switched on
0x00ce	206	Caution	Enclosure %s Power supply %d cable removed
0x00cf	207	Information	Enclosure %s Power supply %d cable inserted
0x00d0	208	Information	Enclosure %s Fan %d returned to normal
0x00d1	209	Information	BBU Retention test was initiated on previous boot
0x00d2	210	Information	BBU Retention test passed
0x00d3	211	Caution	BBU Retention test failed!
0x00d4	212	Information	NVRAM Retention test was initiated on previous boot
0x00d5	213	Information	NVRAM Retention test passed
0x00d6	214	Caution	NVRAM Retention test failed!
0x00d7	215	Information	%s test completed %d passes successfully
0x00d8	216	Caution	%s test FAILED on %d pass. Fail data: errorOffset=%x goodData=%x badData=%x
0x00d9	217	Information	Self check diagnostics completed
0x00da	218	Information	Foreign Configuration Detected
0x00db	219	Information	Foreign Configuration Imported
0x00dc	220	Information	Foreign Configuration Cleared
0x00dd	221	Warning	NVRAM is corrupt; reinitializing
0x00de	222	Warning	NVRAM mismatch occurred
0x00df	223	Warning	SAS wide port %d lost link on PHY %d
0x00e0	224	Information	SAS wide port %d restored link on PHY %d
0x00e1	225	Warning	SAS port %d, PHY %d has exceeded the allowed error rate
0x00e2	226	Warning	Bad block reassigned on %s at %lx to %lx
0x00e3	227	Information	Controller Hot Plug detected
0x00e4	228	Warning	Enclosure %s temperature sensor %d differential detected
0x00e5	229	Information	Disk test cannot start. No qualifying disks found
0x00e6	230	Information	Time duration provided by host is not sufficient for self check
0x00e7	231	Information	Marked Missing for %s on array %d row %d
0x00e8	232	Information	Replaced Missing as %s on array %d row %d
0x00e9	233	Information	Enclosure %s Temperature %d returned to normal
0x00ea	234	Information	Enclosure %s Firmware download in progress
(Sheet 8 of 9)			

Table A.2 Event Messages (Cont.)

Number (Hex)	Number (Decimal)	Type	Event Text
0x00eb	235	Warning	Enclosure %s Firmware download failed
0x00ec	236	Warning	%s is not a certified drive
0x00ed	237	Information	Dirty cache data discarded by user
0x00ee	238	Information	PDs missing from configuration at boot
0x00ef	239	Information	VDs missing drives and will go offline at boot: %s
0x00f0	240	Information	VDs missing at boot: %s
0x00f1	241	Information	Previous configuration completely missing at boot
0x00f2	242	Information	Battery charge complete
0x00f3	243	Information	Enclosure %s fan %d speed changed
0x00f4	244	Information	Dedicated spare %s imported as global due to missing arrays
0x00f5	245	Information	%s rebuild not possible as SAS/SATA is not supported in an array
0x00f6	246	Information	SEP %s has been rebooted as a part of enclosure firmware download. SEP will be unavailable until this process completes.
0x00f7	247	Information	Inserted: %s Info: %s
0x00f8	248	Information	Removed: %s Info: %s
0x00f9	249	Information	%s is now OPTIMAL
0x00fa	250	Warning	%s is now PARTIALLY DEGRADED
0x00fb	251	Caution	%s is now DEGRADED
0x00fc	252	Fatal	%s is now OFFLINE
0x00fd	253	Warning	Battery requires reconditioning; please initiate a LEARN cycle
0x00fe	254	Warning	VD %s disabled because RAID-5 is not supported by this RAID key
0x00ff	255	Warning	VD %s disabled because RAID-6 is not supported by this controller
0x0100	256	Warning	VD %s disabled because SAS drives are not supported by this RAID key
(Sheet 9 of 9)			

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